

CHAPTER I

INTRODUCTION

The Challenge

A conflict between economic and environmental values in California has been growing for several decades. The result has been an increasing challenge to meet regulatory responsibilities while achieving economic viability.

For landowners, increasing regulatory processes have been put in place. Many argue that these regulations create a fragmented approach to resource protection and impose unnecessary burdens on landowners and resource producers. The greatest cost for many seems to be the perpetual uncertainty that precludes them from making reliable management plans or business investments.

Others suggested that the myriad of laws, rules, and regulations are not effectively protecting the environment. Many areas of the State have become the sites of State and federal Endangered Species Act (ESA) listings and Clean Water Act violations. Clearly, the regulatory complexity has not always delivered resource protection.

The challenge confronting California is to design a system that can achieve the economic, environmental, and social goals that will secure a sustainable future.

New Approaches

Under Governor Wilson, the State of California initiated new approaches to secure and reconcile our economic and environmental values. Beginning with his

Resourceful California program in 1991, California has been in the forefront of new conservation efforts. Numerous State agencies have similarly launched initiatives to better integrate protection of environmental and economic values.

These efforts include:

- State Water Resources Control Board's (SWRCB) Watershed Management Initiative
- California Department of Forestry and Fire Protection's (CDF) Sustained Yield Plans
- the Rangeland Water Quality Management Plan
- the California Pesticide Management Plan for Water Quality, a joint effort between the SWRCB and the Department of Pesticide Regulation (DPR)
- the Department of Conservation's (DOC) Agricultural Land Stewardship Program
- California Department of Food and Agriculture's (CDFA) Fertilizer Research and Education Program
- the Department of Fish and Game's (DFG) Coastal Watershed Restoration Program.

For several years, policymakers have explored a watershed-level approach to reconciling environmental and economic values. In February 1995, leaders of the Fish, Farm, and Forest Communities (known as the "Three F" and consisting of representatives of forestry, fisheries and agricultural interests), invited the Resources Agency to participate in their cooperative efforts to devise ways to protect coho salmon. The Resources Agency accepted their invitation, and requested that they also

invite representatives of federal agencies and other stakeholders.

In April 1995, California Forestry Association (CFA) President, and Chairman of the Three F, Gil Murray, requested that the Resources Agency coordinate an expanded effort of the relevant government entities, as well as the economic and environmental stakeholders. The Resources Agency initiated a series of consultations. Through this effort, it was determined that other environmental problems besides the coho were rapidly materializing. Specifically, a decline in coastal steelhead trout would likely lead to their proposed listing under the ESA. Additionally, the federal Environmental Protection Agency (EPA) was apt to list 17 forested watersheds as “impaired” under the Clean Water Act. These additional challenges bolstered the need for a broader and more comprehensive approach.

In the summer of 1995, the Resources Agency began to develop a watershed-oriented program to address these problems. They concluded that an approach to protect fisheries and other resources based on hydrologic boundaries offered a better means to protect and enhance both the environmental and economic values of California’s watersheds.

A consensus-based effort was initiated in January 1996, which included local, State, tribal and federal entities, as well as a spectrum of interest groups. Known as the Coastal Salmon Initiative, this effort sought to find agreement on the elements of a program to support watershed-specific conservation. Differences among the participants over listing decisions shattered this fragile working group in October 1996. Nonetheless, substantial agreement had emerged that a community-based watershed approach was the most promising means to reconcile the environmental and economic values dependent on our salmon-supporting watersheds.

In January 1997, Governor Wilson proposed in his budget a Watershed Initiative to fund additional technical and financial resources for community-based watershed efforts.

Through negotiations with the Legislature, a six-year, \$43 million program was approved in September 1997.

Watershed Protection and Restoration Council

On July 31, 1997, Governor Wilson issued an Executive Order that established a Cabinet-level Watershed Protection and Restoration Council (WPRC) charged with developing a California Watershed Protection Program (Appendix A). The WPRC’s primary responsibility is to provide oversight and coordination of State activities related to watershed protection and enhancement, including the conservation and restoration of anadromous salmonids in the watersheds of California.

The Governor recognized that “a cooperative effort with the federal government, local governments, landowners, fishery representatives, local groups involved in watershed activities, environmental interests, resource-based businesses, other interested parties, and the public is critical to the success of such efforts.” The Governor also recognized the importance of existing regulatory and voluntary conservation activities.

The Governor’s general charge to the Council is to ensure better coordination of these efforts. The main objective of the WPRC is to develop a watershed protection program, which includes an anadromous salmonid conservation element, that will lead to the promulgation of a 4(d) rule by the National Marine Fisheries Service (NMFS) under the federal Endangered Species Act. This approach enables NMFS to exercise the flexibility under the ESA to assist and support the State in developing and implementing adequate State conservation efforts, rather than establishing a whole new federal overlay of processes and requirements. The State’s objective is to have NMFS certify this program as meeting the requirements of the ESA. It further seeks to have the program be a basis for

meeting the goals of State and federal water quality laws.

The results of such a decision would be retaining primary authority with the State and supporting local communities in determining how they best meet their part of the fishery and water quality responsibility. The necessary protection and restoration efforts then could be tailored to reflect the varying conditions that exist across California's diverse watersheds. The end result will be more effective conservation efforts, secured with lower costs and less burden to landowners and affected communities.

The State is seeking a cooperative effort with federal and local governments, landowners, fishery representatives, local watershed groups, environmental interests, resource-based businesses and other interested parties, and the general public to advise and participate in the development of a watershed protection program.

The WPRC, in consultation with a science panel and advisory groups, will accomplish the following tasks:

- 1) A comprehensive review of all regulatory and non-regulatory efforts to protect and conserve anadromous fish and water quality
- 2) A review of all existing and proposed voluntary conservation efforts on private land which protect and conserve anadromous fish and water quality
- 3) A compilation of data and studies relating to anadromous fish populations in California
- 4) A list of recommended implementation and monitoring actions to protect and conserve anadromous fish and water quality.

Structure of the Watershed Protection and Restoration Council

Voting members of the WPRC include the Secretaries for:

- Resources (Chair)
- Environmental Protection
- Food and Agriculture
- Business, Transportation, and Housing
- Trade and Commerce.

The Council also includes ex-officio members, consisting of Chairs or the President of the following agencies:

- SWRCB
- Mining and Geology Board
- Fish and Game Commission
- Board of Forestry
- North Coast Regional Water Quality Control Board (RWQCB)
- Central Valley RWQCB
- San Francisco RWQCB
- Central Coast RWQCB

A working group has been established to help coordinate WPRC activities. The working group is chaired by the Executive Director of the SWRCB and consists of Directors of the following departments and agencies:

- Fish and Game
- Forestry and Fire Protection
- Conservation
- Transportation
- Water Resources
- Pesticide Regulation
- Executive Officers of the North Coast, Central Valley, San Francisco and Central Valley Regional Water Quality Control Boards
- Department of Food & Agriculture

The Council also has established a multi-disciplinary science review panel and advisory committees comprised of representatives from local government,

landowners, agricultural organizations, fishery interests and the public at large.

The Basic Strategy - Building Upon Current Assets

The WPRC will incorporate and coordinate existing efforts to create a cohesive strategy. These coordinated efforts will be augmented, as necessary, to achieve the conservation requirements of law. The program will include three major dimensions.

State-level efforts: This program will address activities for which protection responsibility primarily lies with the State, such as forest regulations, water quality protection and pesticide regulation. The State is committed through a Memorandum of Understanding (MOU) with NMFS to reviewing its existing regulations, their implementation and enforcement to determine their adequacy. The independent science panel and the advisory committees also will assist in this effort.

For example, a focused review is now underway regarding California's forestry regulations. Unquestionably, there have been steady improvements in forest practices in California over the past several decades. However, NMFS, as well as fishery and environmental interests, have said that deficiencies remain in either the rules themselves or in appropriately applying and enforcing them. The current review is examining California forestry in relation to the needs of fish to determine whether refinements or modifications in implementation or regulations are needed.

This document provides baseline information to support review and refinements, as necessary, for other areas of State responsibility.

Local Government efforts: The State program seeks to assist local governments in addressing responsibilities for which "the

buck stops" with local government. County governments have an essential role to play. County responsibilities include private road grading and maintenance, gravel mining operations, storm water management and land-use ordinances. The counties of Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity have approved the specifics of a jointly developed work plan with California to cooperatively develop anadromous fish conservation efforts. The counties of Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, and Monterey are similarly developing a cooperative approach.

Their willingness to provide a county-level approach to these resource needs could establish key parts of the framework for watershed-specific stewardship/restoration plans. The State and NMFS have expressed support for these efforts. The State has already committed funding to the Northern effort, and is now considering a request from the Central coast counties for funding.

Community-based efforts: As experience has amply demonstrated, the greatest knowledge and commitment to healthy watersheds reside with those who live there. State and local governments seek to jointly develop a cohesive program with the federal government to foster and support voluntary community-based protection and restoration efforts. California has a long and growing history of such efforts.

Coordinated Resource Management Plans (CRMPs) are perhaps the oldest form of community-based resource management and a good base to build upon. By expanding the scope of resources addressed, a CRMP could result in legal certainty for the participating landowners.

Other community-based organizations, such as watershed conservancies, are important assets that already are initiating this process in areas such as Mill, Deer and Butte Creeks. The WPRC will learn from these efforts and provide them the coordinated support and assistance to succeed.

The Rangeland Water Quality Management Plan, which was formally adopted by CDF in July 1995, provides a mechanism for rangeland managers to address water quality and fishery needs. Both the SWRCB and EPA Region IX have supported this approach. To date, plans for more than 300,000 acres of range land have been adopted. Several statewide resource producer associations are examining their application to the ESA, Clean Water Act, and to serving the needs of small forest owners and agricultural operators.

Watershed Funding

California has recently increased, and proposes to further increase, its funding commitment to support the California Watershed Protection Program. In recent years, California has expended approximately \$16 million annually for anadromous conservation activities statewide. Last year, the Legislature passed and the Governor signed S.B. 271 (Thompson), which provides an additional \$43 million over 6 years to specifically support watershed restoration efforts, including watershed assessments, developing watershed action plans, implementing restoration projects, and monitoring.

DFG has recently proposed a \$1.5 million supplement to its budget to bolster its anadromous fisheries programs. The Governor's Office has approved this request, and it has been incorporated in both the Assembly and Senate budgets. These funds will primarily support monitoring and research efforts on steelhead populations in coastal watersheds north of the Russian River.

Additionally, the Governor has proposed \$1.9 million in new funding for his Watershed Initiative. This funding has been incorporated into both the Assembly and Senate budgets. This funding will allow State resources to be delivered in a coordinated fashion to community-based groups to enable those groups to meet their

local objectives within the context of the various State and federal resource protection mandates.

Report Scope

This report presents a description of California's resolve to protect its watersheds, to restore those impaired, and to conserve its anadromous fish population together with other species of concern. As similar concurrent efforts proceed through the CALFED process in the Central Valley, this report more fully focuses on issues associated with anadromous fish found in California's coastal areas.

The opening chapters are descriptive: the status of anadromous fish, water pollutants and their sources, existing regulatory and non-regulatory protection programs and restoration efforts. The closing chapters are prospective: State agency commitments to monitoring, adaptive management and improvements to programs that will further protect and restore California's watersheds.

Protecting and restoring watersheds requires the advancement, integration and coordination of community-based watershed efforts complemented and supported by all levels of regulatory and non-regulatory assistance programs. Information in this report is intended to assist all stakeholders in both economic and environmental pursuits.

Next Steps

In creating the WPRC and charging it with development of a State Watershed Conservation Program, Governor Wilson has invited each of us to freshly examine the challenges and opportunities in securing the environmental and economic values dependent on our watersheds.

An integrated resource approach at a watershed scale is now perceived as

environmentally and economically sensible and necessary. Basically, a common economic, environmental and social goal is to secure greater certainty about the future. The emerging broad support for a watershed approach reflects the recognition that our current fragmented method will fail to secure a more certain and better future.

Increasingly it is obvious that viable watershed management cannot be accomplished by individual agencies acting in isolation. Such methodology ensures duplication of some efforts, contradictory mandates and inadequate resources available for program implementation. Tangible improvements can only occur through sustained efforts in a collaborative forum of relevant interest groups, landowners, and local, State, and federal agencies.

In describing the existing State conservation efforts relevant to protection of watersheds and fisheries, this report provides the base-line of information for determining where to go next. This could include consolidation, coordination, and augmentation of these existing efforts, as most appropriate to achieve the program purposes of the Governor's Executive Order.

The WPRC invites everyone to help constructively review and critique these efforts. The sum of respective experiences and insights can best guide us in determining needed refinements or changes.

To help focus and stimulate your review and comments, listed below are a few of the challenges that must jointly be met:

- 1) The sequential description of these separate programs fairly reflects the current lack of integration and coordination between them. It is important to remember that most of the described programs were developed prior to the recent emergence of watersheds as an appropriate scale to protect and restore our natural resources. Thus a major challenge is how to orient and align existing programs into a watershed approach.
- 2) Similarly, we need to examine what is missing or needs to be done differently than the current programs provide. With all these current programs, regulations and efforts, why are there continuing problems with fish populations and water quality?
- 3) There is evidence that increased and improved protection efforts are allowing some watersheds to begin the process of healing. How much is it now a matter of additional protection and active restoration work, or simply accepting that time is necessary for natural processes to re-establish healthy, sustainable watersheds?
- 4) In devising a program to support a community-based, watershed approach, how is it possible to provide the necessary local flexibility to craft the best solutions to the specific watersheds, while assuring effective implementation and oversight to meet State and federal goals?
- 5) How can the WPRC integrate or at least better coordinate federal management with this program in order to achieve cohesive watershed approaches? While federal efforts, such as the recently unveiled Clean Water Action Plan, espouse community-based, watershed efforts, the federal support system for land-owners has been shrinking. How does the WPRC get the federal investments necessary to successfully develop and implement this approach?
- 6) This program will need a clear, specific strategy to guide its implementation, including establishing necessary priorities for use of available resources. Simultaneously, this strategy can become the basis for securing State and federal funding to implement elements of the program.
- 7) The WPRC cannot overlook deep-seated adversarial relationships and low trust among almost all of the parties. This will

complicate an already complex and difficult task. How can the WPRC best structure the dialogue necessary for the diverse interests to reach sufficient agreement to enable the program to be effectively implemented?

Despite these challenges, there is a growing understanding among all parties that a common objective is shared: vibrant, healthy populations of salmon, steelhead and human communities. Focusing on this objective is the only hope for resolving long-standing disagreement and moving forward with the business of conserving and restoring our watersheds, along with their dependent values that range from fishery resources to sustainable communities.

CHAPTER II

UNDERSTANDING WHAT AFFECTS

ANADROMOUS FISH

Introduction

Though the relative causes are still being debated, anadromous fish populations have declined in coastal streams for many years¹, so much so that restoration of California's anadromous fish populations was mandated by the Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988 (SB 2261). This policy states that the state will strive to significantly increase the natural production of salmon and steelhead by the end of the century. The legislation directs the Department of Fish and Game (DFG) to develop a program to double the naturally spawning anadromous fish populations by the year 2000, thereby officially recognizing that natural production of anadromous fish is the desired condition.

The declines in naturally spawning fish have been caused by direct and indirect influences in three areas: harvest, hatcheries and habitat. Harvest refers to the removal of fish for commerce or sport. This has sometimes been at a higher rate of loss than could be replaced by the survivors in one generation. Hatcheries are designed to augment populations in order to offset

harvest and the loss of natural spawning grounds due to dams.

Hatcheries have been implicated for introducing diseases into natural populations and causing loss of genetic diversity. Habitat quality losses have been attributed to changes in ocean conditions, recent drought, human population growth, land management practices, introduced exotic species, water appropriations and migration barriers such as dams. Degraded instream habitats and loss of genetic diversity from a decreasing adult fish population are recognized as exacerbating negative impacts by reducing the rate of recovery of fish populations and lowering the ability of populations to rebound.

Degraded stream habitats result from reduced available water, excessive sedimentation, flow modification, changes in the structure of streamside vegetative canopy and the loss of habitat-forming wood debris in and next to the channel, all reducing the quality and availability of habitat and the survivability of salmonids in coastal streams.

A variety of factors over many years have affected the fisheries. A direct and corresponding decrease in effect would probably not result from the removal of any one factor. A shift in many conditions resulted in ecosystem failure for anadromous fish, and a corresponding shift toward favorable ecosystem conditions is needed. In recent years, hatchery policies have changed to reflect new understanding

¹For a complete review of the status and causes of decline of Pacific salmon ecosystems, please refer to "Pacific Salmon and Their Ecosystems" (Stouder, Bisson, Naiman, 1997).

of the effect that artificial fish production has on genetic diversity, and harvest has been reduced until some fish stocks are not harvested. In addition, there have been changes in laws requiring public review of projects, additional timber harvest rules and water pollution regulations, and increased public awareness which should benefit fisheries. These changes have not, as yet, been credited as reaching the magnitude necessary to reverse the declining fish population trend.

The existing ecological and regulatory situation has resulted in depressed commercial and sport fishing economies, increased permitting requirements for project proponents and the specter of decreased economic growth for communities in some watersheds.² Because of the generally poor overall condition of salmon habitat, and the failure to adequately correct many of the previously identified habitat and water management deficiencies, the trend is toward increasingly depriving Californians of economic benefits, especially in coastal communities heavily dependent on commercial and recreational fishing. Also, the increased regulatory process and burden of proof required by the Endangered Species Act (ESA) will place additional burdens on county governments, ranches, farms and businesses.

Anadromous fish stocks have declined throughout the Pacific Northwest for more than 130 years. In response to the poor condition of anadromous fish in California, the Fish and Game Commission listed coho salmon as endangered (June 22, 1995) under state law in areas south of San Francisco and the National Marine Fisheries Service (NMFS) listed coho as threatened (Dec. 2, 1996; May 6, 1997) throughout the state under federal law (ESA).

²Watershed is used interchangeably in this document with sub-basin and basin. The appropriate scale must be established by outlining hydro-geographic boundaries as necessary for watershed planning.

Recently, NMFS listed steelhead trout as endangered in southern California (August 11, 1997), threatened in south-central California (Aug. 11, 1997), threatened in the Central Valley (March 13, 1998), and deferred the decision to list populations in the Klamath Mountains Province and northern California (Figure 2-1).

On February 26, 1998, NMFS announced its intention to list spring-run chinook salmon as endangered and fall-run chinook as threatened in the Central Valley. Chinook on the north coast would be listed as threatened. At the time of these listings, naturally spawning stocks of pink and chum salmon are no longer found in California, the fall migratory run of chinook is declining, the winter-run is listed as endangered and the spring chinook is extirpated from the San Joaquin River system and is a remnant of the historical count elsewhere.

The following discussion centers on steelhead and coho because they were recently listed as protected under the endangered species laws, but similar conditions exist for other species of anadromous fish.

Life Histories

Steelhead

Steelhead are the anadromous form of rainbow trout, a salmonid species native to western North America and the Pacific coast of Asia. In North America steelhead are found in Pacific Ocean drainages from southern California to Alaska. In Asia they are found on the east and west coast of the Kamchatka Peninsula, with scattered populations on the mainland (Burgner et al., 1992). In California, known spawning

populations are found in coastal rivers and streams from Malibu Creek in Los Angeles County to the Smith River near the Oregon border, and in the Sacramento River system. The present distribution of steelhead in California has been greatly reduced from historical levels (McEwan and Jackson, 1996).

Steelhead are similar to some Pacific salmon in their ecological requirements. They are born in fresh water, emigrate to the ocean where most of their growth occurs, and then return to fresh water to spawn. Unlike Pacific salmon, steelhead do not necessarily die after spawning. Post spawning survival rates are generally quite low, however, and vary considerably between populations.

In California most steelhead evolve and spawn in small streams and tributaries from December through April where historically cool, well-oxygenated water is available year-round. The female selects a site where there is good intergravel flow, then digs a spawning site (redd) and deposits eggs while an attendant male fertilizes them. The eggs are then covered with gravel when the female begins excavation of another redd just upstream.

The length of time it takes for eggs to hatch depends mostly on water temperature. Hatching of steelhead eggs in hatcheries at 51° F takes about 30 days (Leitritz and Lewis 1980). Fry emerge from the gravel usually about four to six weeks after hatching, but factors such as redd depth, gravel size, siltation and temperature can speed or retard this process.

The newly emerged fry move to the shallow, protected areas associated with the stream margin (Royal 1972; Barnhart 1986). They soon move to other areas of the stream and establish feeding locations, which they defend (Shapovalov and Taft 1954). Most juveniles inhabit riffles, but some of the larger ones will inhabit pools or deeper runs (Barnhart 1986). Juveniles can remain in fresh water for one to several years before migrating downstream and undergoing physiological changes (smoltification) and entering the ocean.

Researchers have made significant progress over the last several decades in understanding the relationship between the marine environment and anadromous fish population dynamics. Most of the published information pertains to salmon in the north Pacific Ocean; little is known about steelhead. Pearcy (1992) provides a concise summary of information regarding ocean ecology of north Pacific salmonids.

California steelhead spend from several months to three years in the Pacific Ocean before returning to fresh water.

Approximately 47 percent and 35 percent of the spawning adults in Waddell Creek had spent one and two years at sea, respectively (Shapovalov and Taft 1954). The age composition of high seas steelhead is also dominated by one (61.9 percent) and two (31.4 percent) year ocean fish, with a maximum of six years at sea (Burgner et al., 1992). Some steelhead exhibit what is called a "half-pounder" life history; they go to sea for only a few months, then return to fresh water but do not spawn (Kesner and Barnhart 1972). Steelhead stocks from Alaska to California are widely dispersed and extensively intermingled. Available evidence indicates little or no differences in ocean distribution (Light et al., 1988 and 1989; Burgner et al., 1992; Pearcy 1992).

Specific ocean migration and distribution information for southern California steelhead stocks is unknown. There have not been any tagging studies conducted on the southern streams to evaluate ocean distribution of southern steelhead and no fish tagged on the high seas have been recovered in these streams, with the exception of one return to the Carmel River in 1965.

Without additional evidence from recoveries of tagged steelhead, it is not possible to reliably separate stocks and differentiate ocean distribution of stocks between states and/or between California streams (Burgner et al., 1992). In addition, no steelhead fishery exists off the coast of California to evaluate whether southern steelhead stocks

utilize these waters. Additional studies would be beneficial for understanding steelhead marine migrations and strengthening California steelhead management practices.

Coho

The coho salmon is one of seven species of Pacific salmon belonging to the genus *Oncorhynchus*, and one of five such species found in California. It presently ranges in fresh water basins from Hokkaido, Japan and the Russian Far East, around the Bering Sea and Aleutian Islands to mainland Alaska, and south along the North American coast to Monterey Bay, California. Coho salmon have been successfully introduced into more non-endemic lakes and streams than any other Pacific salmon species, including all of the Great Lakes. The coho salmon was first described as a species, *Salmo kisutch*, by Walbaum in 1792, from specimens taken from the rivers and lakes of the Kamchatka Peninsula, Russia. It was eventually described as *Oncorhynchus kisutch* by Jordan and Evermann in 1896-1900. *Oncorhynchus* means “hooked snout” and *kisutch* is Walbaum’s interpretation of the local name for this species used in Kamchatka. Coho salmon is the accepted common name as adopted by the American Fisheries Society and federal and state agencies.

The name “coho” comes from an American Indian name for this salmon. Other common names include silver salmon, blueback and sea trout (Department of Fish & Game, 1994).

The life history of the coho salmon in California has been well documented by Shapovalov and Taft (1954) and Hassler (1987). Coho salmon generally return to their natal streams to spawn after spending two years in the ocean but some males, called “jacks,” may return after one growing season in the ocean. Spawning migrations begin after heavy late-fall or winter rains breach the sand bars at the mouths of

coastal streams, allowing the fish to move into them. However, migration typically occurs when stream flows are either rising or falling, not necessarily when streams are at a peak flood. The early part of the run is dominated by males, with females returning in greater numbers during the latter part of the run.

Females choose redds, usually near the head of a riffle and just below a pool, where the water changes from laminar to turbulent flow and there is a medium to small gravel substrate. The flow characteristics of the location of the redd usually ensure good aeration of eggs and embryos, and flushing of waste products. The water circulation in these areas helps fry emergence from the gravel. Each female builds a series of redds, moving upstream as she does so, and deposits a few hundred eggs in each. A female can lay between 1,400-7,000 eggs. Spawning may take about a week to complete. A positive correlation exists between fecundity and size of females. Hassler (1987) noted a dominant male accompanies a female during spawning, but one or more subordinate males also may engage in spawning. He also found both males and females die after spawning, although the female may guard a nest for up to two weeks.

Embryos hatch after eight to 12 weeks of incubation, the time being inversely related to water temperature, where colder water increases the hatch time. Hatchlings remain in the gravel until their yolk sacs have been absorbed, four to 10 weeks after hatching. According to Baker and Reynolds (1986), under optimum conditions mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent. Upon emerging, they seek out shallow water, usually along stream margins. Initially they form schools, but as they grow bigger the schools break up and the juveniles (parr) set up individual territories. An optimal habitat is in deep pools created by large woody debris (LWD) and boulders in heavily shaded sections of stream.

As water temperatures decrease into the fall and winter months, fish stop or reduce feeding due to lack of food or in response to the colder water, and growth rates slow down. Toward the end of March and the beginning of April they begin to migrate downstream and into the ocean. Storms that flush fish out of the system before they are ready can result in heavy mortality. An out-migration in California streams typically peaks in mid-April to mid-May, if conditions are favorable. Migratory behavior is related to rising or falling water levels, size of fish, day length, water temperature, food densities and dissolved oxygen levels.

At this point, the out-migrants are about one year old and 10-13 cm in length. The fish migrate in small schools of about 10-50 individuals. Parr marks are still prominent in the early migrants, but the later migrants are silvery, having transformed into smolts. Coho only remain in fresh water one season.

Coho spawn in many substrate conditions. Usually the available spawning habitat is limited to that with less than optimal small gravel, containing high sand and silt content and moderate to high embeddedness. Coastal streams are characterized by large quantities of highly mobile sediment bedload. Sometimes, juveniles must survive in pools that exhibit elevated summer and fall water temperatures at the margin of acceptability. The ability of coho to use marginal spawning and rearing habitats is an expression of their wide range of tolerance compared with other salmonids. Coho may be the least particular of all Pacific salmon in choice of spawning sites and are opportunistic in the use of a wide range of spawning substrates (Sandercock 1991). However, a reduction in substrate suitability that is already marginal can have a considerable impact on hatching success. Although juveniles prefer cold water, they have tolerance for diurnal temperature peaks that can reach the low 20°s C (70° F), providing nocturnal temperatures drop back into the 15-19° C (60-66° F) range or less.

Ocean Mortality

Both coho and steelhead experience most of their marine phase mortality soon after they enter the Pacific Ocean (Pearcy 1992). Ocean mortality is poorly understood, however, because few studies have been conducted on this vast body of water. Possible causes of juvenile mortality are predation, starvation, osmotic stress, disease and advective losses (Wooster 1983; Hunter 1983, both cited in Percy 1992; Percy 1992). Advective losses are mortality associated with the divergence of water currents which disperses nutrients and organisms that greatly depend on physical transport rather than active swimming. Losses from this cause are likely lower for juveniles that enter the sea at a larger size (Percy 1992). Predation is probably the primary cause of marine mortality of juveniles, and mortality and fish size are presumably inversely related (Percy 1992). Known potential predators of juvenile chinook and coho salmon, and presumably juvenile steelhead, in marine or estuarine waters in Oregon include 29 species of fish, 36 species of birds and eight species of mammals (Cooper and Johnson 1992).

Warm temperatures and low salinities have been correlated with poor survival of coho and chum salmon smolts (Holtby and Scrivener 1989; Holtby et al., 1990, both cited in Percy 1992). Pacific hake (*Merluccius productus*) and Pacific mackerel (*Scomber japonicus*) possibly invade nearshore areas and prey intensely on juvenile salmonids during warm water years (Holtby and Scrivener 1989; Holtby et al., 1990, both cited in Percy 1992). Coho survival may be influenced by river flow patterns (Percy 1992).

The Columbia River drainage has been greatly affected by dams and storage of water which have reduced the peak flow during the spring, retarding the downstream migration of smolts and affecting the size and structure of the Columbia River plume during the spring and early summer when coho and steelhead smolts enter the ocean

(Francis et al., 1989, as cited in Pearcy 1992). A strong plume allows juveniles to expend less initial energy to migrate, and allows for a greater and quicker distribution throughout the marine environment. It is possible that reduced spring outflows of highly regulated rivers have decreased the extent of cold fresh water plumes into the Pacific Ocean, which would have otherwise dispersed the juveniles farther offshore.

High Seas Driftnet Fisheries Impacts

Based on recoveries of marked/tagged North American steelhead (Light et al., 1988; Burgner et al., 1992), high seas steelhead distribution and driftnet fisheries overlap. The recent decline in steelhead abundance along the Pacific Coast may be partially attributed to the harvest of steelhead in high seas driftnet fisheries (Cooper and Johnson 1992). The Japanese salmon driftnet fishery (mothership and landbased) closed in 1991, and the high seas squid driftnet fishery was closed at the end of 1992. From an estimated 1.6 million steelhead adults returning to the Pacific Coast of North America (Light 1987; Burgner et al., 1992) the combined authorized high seas driftnet fisheries caught less than 3 percent from 1983 through 1990 (Cooper and Johnson 1992).

Unauthorized driftnet fishing on the high seas can potentially cause a substantial level of salmonid mortality (Pella et al., 1991; Cooper and Johnson 1992). A total of 71 and 165 foreign vessels was observed outside authorized fishing areas in 1990 and 1991, respectively (NOAA-NMFS 1991, as cited in Cooper and Johnson 1992). Cooper and Johnson (1992) estimated that the unauthorized high seas driftnet fisheries harvest between 2 percent (32,000) and 28 percent (448,000) of the steelhead that return to the Pacific coast of North America. Using this range and assuming there were approximately 250,000 California adult steelhead, an estimated 5,000 to 70,000 California steelhead were harvested in this

fishery. This assumes that all fish have an equal chance of being harvested, which may not be a valid assumption.

Based on tag returns to California streams from the high seas steelhead tagging study, Hallock (1989) estimated that 24,600 California steelhead were also killed annually by the squid fishery, or 12.3 percent of an "estimated" 200,000 steelhead that were harvested by the North Pacific squid fishery. The 12.3 percent estimate is based on a return of nine tags in California, out of 73 high seas tag returns to Pacific Coast streams. If North American steelhead stocks are extensively intermingled with little or no differences in ocean distribution (Light et al., 1988 and 1989; Burgner et al., 1992; Pearcy 1992), then Hallock's assumption that random tagging of steelhead on the high seas would lead to equal opportunity of tag recovery seems reasonable.

Even if the high seas driftnet fisheries harvested a combined 31 percent (3 percent authorized and 28 percent unauthorized) of the steelhead, the 50 percent decrease in North American steelhead runs observed between 1986-87 and 1990-91 cannot be solely attributed to this fishery (Cooper and Johnson 1992).

Predation

Pinnipeds, in particular the California sea lion (*Zalophus californianus*), the Stellar sea lion (*Eumetopias jubatus*) and the Pacific harbor seal (*Phoca vitulina*), are often accused of consuming or injuring large numbers of salmonids and have a bad reputation with anglers (Beach et al., 1985, as cited in Cooper and Johnson 1992). Pinnipeds are primarily opportunistic and feed on schooling fish (e.g., herring, perch) and sedentary fish (e.g., sole, sculpin) in the marine environment (Brown and Mate 1983). Roffe and Mate (1984) found that pinnipeds fed opportunistically on fast swimming salmonids, and less than 1 percent of the adult Rogue River (Oregon) summer steelhead were preyed on during their upriver spawning migration. Salmonids

appear to be a minor component of the diet of marine mammals (Scheffer and Sperry 1931; Jameson and Kenyon 1977; Graybill 1981; Brown and Mate 1983; Roffe and Mate 1984; Hanson 1993). Principal food sources are lampreys (Jameson and Kenyon 1977; Roffe and Mate 1984), benthic and epibenthic species (Brown and Mate 1983), and flatfish (Scheffer and Sperry 1931; Graybill 1981).

Predation by California sea lions can have an adverse impact on local steelhead populations, particularly in areas where the fish are concentrated and provide greater opportunity for predation (Cooper and Johnson 1992). Pfeifer (1987), as cited in Cooper and Johnson (1992), estimated that 43 percent of the steelhead run into the Lake Washington system (Washington) was lost due to sea lion predation during the 1986-87 season, and he attributes the low return of steelhead to fresh water to these high predation rates. Predation appears to be greatest where adult steelhead are blocked or hindered in their migration and individual sea lions become accustomed to feeding on them.

Low-flow conditions in streams can enhance predation opportunities, particularly in southern California streams, where adult steelhead may congregate at the mouths of streams waiting for high flows that will make the stream accessible. In addition, warmer water temperatures may affect steelhead mortality from predation directly or indirectly through stress and disease associated with wounds inflicted by pinnipeds.

Although predation on steelhead by marine mammals occurs in local areas, it is not likely an important factor in the coastwide steelhead population decline (Cooper and Johnson 1992). Based on catch data, some of the best catches of coho, chinook and steelhead along the Oregon coast occurred after marine mammals, kingfishers and cormorants were fully protected by law (Bayer 1989, as cited in Cooper and Johnson 1992).

Predation and other forms of interspecific competition in modified environments may be

a major factor affecting salmon populations in some aquatic systems. Dams have increased flows in normally low flow months and increased some predators such as northern squawfish (*Ptychocheilus sp*) populations which prey on juvenile anadromous fish. Warmer summer waters from lack of stream shade have increased the numbers of warm water tolerant fish such as sunfish species, hardhead, squawfish and roach. Substrate changes such as ripraping banks have favored some species (e.g. squawfish and sunfish in the Sacramento River system) that out compete or prey on salmonids.

A variety of exotic predator and prey species have been introduced on purpose and accidentally in California stream and lake systems. Results of these species composition modifications have varied greatly depending on the vulnerability of anadromous fish in the local situation, but few have been positive. There have been elimination or reduction of native species that salmonids use as prey, predation on salmonids, and introduced prey species not available for salmonids because of timing or location.

Warmwater fish have been increasingly apparent in coastal streams and their impact on salmonids, while intuitive the situation remains largely unstudied. However, some changes have been suggested for coastal waters such as increased shade and lower summer flows below dams such as the Eel River system. Brown and Moyle (1981) reviewed available literature and suggested that squawfish may prey extensively young salmon in lakes, but there is little evidence that predation has much impact on the number of returning adults in a natural stream system. This may reflect the lack of attention to this issue in studies rather than lack of impact.

Some evidence found by Brown and Moyle indicate that highly localized, seasonal or unusual habitat situations produce evidence that predation and interspecific competition occurs. The low power of the evidence may be a function of the lack of study tools

and focus and suggests that research should continue.

Environmental Conditions

Oceanic and climate conditions such as sea surface temperatures, air temperatures, strength of upwelling, El Niño events, salinity, ocean currents, wind speed, and primary and secondary productivity affect all facets of the physical, biological and chemical processes in the marine environment. "Subtle changes in key environmental parameters (e.g., ocean currents, wind speed and direction, and presence of predators) or large-scale changes (e.g., global warming) can alter abundance, distribution, and availability of fish populations" (Glantz 1990, as cited in Cooper and Johnson 1992).

The Alaska and California currents influence the biological production at all levels of the food chain in the North Pacific (McLain 1984; Francis and Sibley 1991, both cited in Cooper and Johnson 1992). The north flowing Alaska current and the south flowing California current are separated by the subarctic current. The strength and relative proportion of these currents can dramatically affect salmonid production along the continental shelf (Pearcy 1992).

El Niño and reduced salmonid production are often discussed in the same breath. El Niños are episodic and vary in intensity (Pearcy 1992). Some of the conditions associated with El Niño events include warmer water temperatures, weak upwelling, low primary productivity (which leads to decreased zooplankton biomass), decreased southward transport of subarctic water, and increased sea levels (Pearcy 1992). During El Niño years the divergence of the North Pacific Drift is far to the south, the mass transport into the Gulf of Alaska is large (e.g., Aleutian atmospheric low pressure is strongly developed), and the subarctic influence in the California current is decreased (Pearcy 1992).

For juvenile steelhead, warmer water and weakened upwelling are possibly the most important of the ocean conditions associated with El Niño. During the 1982-83 El Niño event, juvenile salmon distribution was shifted northward: few juvenile coho salmon were found off the Oregon and southern Washington coast and catches were high off the northern Washington coast (Pearcy 1992). During an El Niño year, juvenile California steelhead would need to migrate further north to find the preferred cooler water temperatures. Because of the weakened upwelling during an El Niño year, juvenile California steelhead would need to more actively migrate offshore through possibly stressful warm waters with numerous inshore predators. Strong upwelling is probably beneficial because of the greater transport of smolts offshore beyond major concentrations of inshore predators (Pearcy 1992).

In addition, survival of maturing or adult steelhead may be affected by El Niño events. Pearcy et al., (1985) and Johnson (1988), both cited in Pearcy (1992), reported that 58 percent of the predicted Oregon adult coho production in 1983 died during their last year in the ocean. El Niño events may be highly stressful to California steelhead because they must travel through an abnormal amount of warm and relatively unproductive water.

Drought in fresh water systems can also result in depressed production for a given year class of anadromous fish. Low available water will reduce the instream habitat area for the developing juveniles and limit their numbers substantially, even result in a complete loss of production for the stream. California has a recent six-year history of drought which will influence all populations of coho and many steelhead.

Status of Anadromous Fish

Steelhead

Rough estimates place the total statewide population at 250,000 adults, less than half the population of 30 years ago. The decline of California steelhead appears to be part of a more prevalent coastwide steelhead decline. NMFS identified the major factor causing the decline in California as fresh water habitat loss and degradation. This has resulted mainly from three factors: inadequate stream flows, blocked access to historic spawning and rearing areas due to dams, and human activities that discharge sediment and debris into watercourses.

The historic range of steelhead on the north coast (north of San Francisco Bay) has not been reduced as drastically as it has in other areas of the state. This area has the greatest amount of remaining steelhead habitat in the state and the most abundant populations. The Klamath-Trinity river system supports the greatest number of steelhead in California. However, these stocks have declined from an estimated run size of 283,000 adults in the early 1960s to about 150,000 in the early 1980s. Steelhead runs in north coast drainages are comprised mostly of wild fish, although the percentage of wild fish appears to have decreased in recent years. Adverse impacts to north coast stocks are mainly from land-use activities, primarily timber harvest, agriculture, water diversion, gravel mining and predation by recently introduced squawfish.

Steelhead ranged throughout the tributaries of the Sacramento and San Joaquin rivers prior to the dam construction, water development and watershed perturbations of the 19th and 20th centuries. Populations have been most severely affected by dams blocking access to the headwaters of all the major tributaries. Consequently, most runs are maintained through artificial production. The average annual run size in the Sacramento River system above the mouth of the Feather River in the 1950s was estimated to be 20,540 fish. The annual run size for the total Sacramento River system in 1991-92 was probably less than 10,000

adult fish. The decline of Central Valley naturally-produced steelhead has been more precipitous than that of the hatchery stocks: numbers of wild steelhead above Red Bluff Diversion Dam on the Sacramento River have decreased from an average annual run size of roughly 12,900 in the late 1960s to approximately 1,100 in 1993-94. Wild stocks are mostly confined to upper Sacramento River tributaries such as Deer, Mill and Antelope creeks and the Yuba River.

Southern steelhead (those occurring south of San Francisco Bay) were formerly found in coastal drainages as far south as the Santo Domingo River in northern Baja California and were present in many streams and rivers of southern California. Today, Malibu Creek in Los Angeles County is the southernmost stream containing a known spawning population. Southern steelhead are the most jeopardized of all of California's steelhead populations. Population numbers have declined drastically in nearly all streams where they exist, and runs have been extirpated from many others. Of 122 streams south of San Francisco Bay known to have contained a steelhead population, 47 percent have populations with reduced production from historical levels and 33 percent no longer support populations. Major adverse impacts to southern steelhead are from urbanization and water impoundment and diversion.

Coho

Coho salmon historically occurred in as many as 582 coastal streams from the California-Oregon border, south to the San Lorenzo River along the northern edge of Monterey Bay (Brown et al., 1994). They once inhabited the Central Valley but are now rarely observed. The historical spawners probably numbered close to 1 million in the mid-1800s, which declined to 100,000 spawners in the 1950s and 1960s (DFG, 1965). Today spawners are roughly estimated as 5,000 natural spawners by NMFS in its findings for ESA listing. The winter spawning conditions requirements of coho reduce the opportunity to count

returning adults because of turbid water and high flows. However, a reportedly reduced distribution (perhaps less than 200 streams) and abundance of juveniles (few to moderate in each stream) indicates that the population may not be robust.

Population Recovery

Hatcheries

California hatcheries can be classified into three major categories, based on objectives for production: mitigation production to make up for lost habitats due to dams; enhancement production to support higher-levels of harvest; and supplementation production to boost or restart populations. These facilities have changed over the years to respond to the worsening conditions for salmonids. Today, hatchery objectives are to manage all facilities to minimize interactions between hatchery and naturally-produced fish and limit production to a level needed for mitigation as appropriate. Cooperative hatcheries and rearing facilities are designed to provide additional fishing resources and augment natural runs. Hatcheries are being used to reestablish extinct runs on some streams where native genetic stocks are still available.

Hatchery policies will continue to be reviewed to augment and not impede the recovery of native runs of salmon species.

Harvest

Harvest goals are continually reviewed for their impacts on native species and this information is reviewed by the California Fish and Game Commission in public session.

Steelhead

Adult steelhead sport harvest statistics gathered through the Steelhead Trout Report-Restoration Card program indicate that harvest rates may be lower than they were in the 1950s and 1960s. An analysis of harvest for the Klamath-Trinity and Sacramento river systems, the two most popular steelhead fisheries in the state, indicate that over-exploitation of wild stocks is not occurring. There is no substantial documentation that angler harvest of adult steelhead is excessive or detrimental on a widespread basis and is causing the statewide decline.

Over the past several years, DFG has endeavored to prevent over-harvest on a local basis by recommending specific regulation changes to reduce or prevent harvest on stocks that have exhibited severe declines. New recommendations are being prepared and some of the regulations that the Fish and Game Commission has adopted include:

- Implementation of a maximum size limit for steelhead of 22 inches for the period of September through February in the Sacramento River system to protect spawning adults.
- Angling closures or reduced bag limits/seasons for most summer steelhead stocks.
- For all north coast streams except the Klamath-Trinity, no more than one steelhead over 22 inches may be taken per day. Most steelhead spawning tributaries on the north coast are closed to fishing year-round.
- Angling closures for the anadromous portions of nearly all southern California coastal streams to protect the endangered southern steelhead.

Coho

The ocean commercial and sport fisheries regulations have been modified to prohibit harvest of coho salmon, although catch-and-release angling for coho is still allowed in inland waters. For the Klamath River

Basin, sportfishing is still allowed for coho, but only in the mainstem of the Klamath and Trinity rivers and not in the tributaries where coho spawn and rear. The contribution of coho salmon to the in-river sport catch coast-wide is unknown.

Habitat

Habitat degradation has been associated with greater than 90 percent of the documented extinction or declines of salmon stocks (Stouder, et al., 1997). The historical land use for the past 130 years on public and private lands have left us with a legacy of altered habitats that will require considerable time and effective strategies to recover. A return to historical conditions is already impossible on large portions of landscape. Effective habitat management at a watershed scale requires the incorporation of salmon life history needs into land management decisions.

Land Management Principles

It is generally agreed that an effective strategy to protect salmonid resources begins with an understanding of watershed processes and attributes that shape the instream habitats essential to salmonid life cycle needs. Protection measures have to ensure that seven life history needs are met:

- 1) Adults must be able to enter the channel or estuary.
- 2) Migration up the channel must not be blocked.
- 3) Spawning activities should be in clean gravel.
- 4) Eggs must successfully reside in gravel until they hatch.
- 5) Fry must be able to escape the gravel.

- 6) Juvenile rearing habitat must be available.
- 7) Smolts must be able to safely migrate downstream when they are ready, through estuary waters and out to sea.

Appropriate habitat conditions must exist for each of these life stages and in sufficient abundance to produce the maximum benefit for a one year class of fish. Land managers at the watershed scale have tremendous influence over these conditions through modification of five watershed processes that result in habitat formation: (1) water quantity and quality; (2) sediment production; (3) wood size, function and availability; (4) nutrient availability; and (5) energy from solar and water flow.

Many conditions that affect fish populations cannot be controlled, such as weather, ocean conditions, earthquakes, predation and some diseases. The human impacts that add to these conditions and result in sharp population declines can and must be controlled as a stewardship that anticipates and offsets the negative conditions that the fish face if they are to endure and recover.

To ensure the survival of natural-spawning anadromous stocks in California, high quality, fresh water habitats for spawning, rearing, refugia and passage must be provided. In order to manage land compatibly with anadromous fish streams, fish needs must be understood in terms of possible interference with habitats and watershed processes from land management activities. Project changes and mitigation measures can then be developed.

The following four basic land use principles describe the physical characteristics (Flosi and Reynolds, 1994) of essential habitat and stream functions for anadromous fish which should be protected (Steele, 1997, Oceans 97 Conference).

- 1. The key habitat conditions for each life history stage of salmonids must be protected, retained and restored.**

For land managers, it is not necessarily what is taken, but what is left that is important. Essential elements must be recognized and preserved. Life history requirements of a given species determine what physical elements are necessary to make up suitable habitats. For salmonids it is appropriately-sized spawning gravel, wood debris or larger rocks that make up bottom roughness, and clean, oxygenated cold water. The composition of physical attributes present in or near the channel shape and influence the degree and quality of habitats available to salmonids.

The quality and quantity of habitat are measured by their ability to support all of the life history stages of the species in question. Each species may have different requirements. For a community of species, the sum of all life history needs in a watershed can result in a large inventory of important elements forming a complex matrix. The restoration of these elements is the center piece of many restoration projects. Some of these elements may be more essential to a species than others. Understanding the importance of key elements is essential to recognizing and avoiding watershed problems, and a strategy for retaining these elements should be part of any land-use practice.

Important elements for salmonids for each life history stage are:

- Migration: Leave large logs in the channel and large trees in the side stream area (that will recruit to the stream) to provide instream hiding from flood flow currents.
- Spawning: Clean (not embedded with fine sediment) gravel of suitable size is needed. Management plans should include erosion protection in streamside zones such as gravel surfaces on roads to reduce silt production. Ground disturbance close to streams should be avoided. Roads should be minimized in number and constructed so that they do not interrupt hydrologic function of the watershed and water runoff from roads will not carry sediment.

- Egg and fry survival in gravel and hiding space under cobble and wood: Reduce sedimentation as well as apply seasonal restrictions for roads crossing streams.
- Juvenile rearing: Boulders, logs and roots provide escape from flows and predators. Side stream trees that provide habitat shading and maintain low water temperatures should not be removed. Trees that have a high potential to recruit to the channel should be protected and competing trees thinned to promote fast growth and large size.
- Smolts: Elements that provide escape from flows and predators during downstream migration should be protected.

2. The basic structure of watercourses must be protected and maintained to provide basic needs of functioning habitats.

To some extent, it is not so important to chronicle what is removed from or changed in a functioning system, as is the structure of what must remain to function properly as habitat. A drought may influence the fish production of a stream system because of low flows that decrease the habitat area available. However, if enough structural features of the stream, such as pool depths, are protected, life history needs can be met and the cycle completed for surviving fish. Fish production can then quickly return in years with adequate flows. Dams are important structures that produce water during low flow periods, but block adults from upper watershed areas. This is the greatest cause for steelhead decline in the Central Valley and southern California. Dams may also dampen channel-shaping flows so that channel structure for fish is not formed and gravel below outflows are scoured away. Dams also prevent the recruitment of new spawning gravels from zones of erosion.

Important channel structure for salmon are pools, undercut banks, side channels or woody debris large enough and situated to provide an escape from flow or predators.

The value of some structure is difficult to appreciate. Consider a situation where the appropriate channel depth and all the appropriate elements exist for fish migration, spawning and juvenile out-migrant passage. However, the basic structure of the channel is altered by a project that removes in-channel objects, thus creating a laminar flow without flow shadows for fish to hide behind. In this situation, the channel capacity is improved from the standpoint of flood control, but the structural changes can effectively remove scour pools and escape areas and increase flow velocities.

Even though the channel appears to allow fish use because the water is deep and large surface area is visible, storm flow velocities may deter effective upstream migration for adult fish that cannot overcome the higher velocities or find hiding areas. Spawning gravel can be swept away and banks can collapse, making the channel shallower and wider. Storms later in the year can cause eggs, fry and juveniles to be flushed out of the system prematurely and not survive.

Bank stabilization projects or even culvert placement for stream crossings often changes the channel's structure but rarely improves it for fish. Culverts in a fish passage area must be designed to allow fish passage. Bank stabilization projects should result in reducing harmful sediment levels and not in increased channel bed down-cutting, decreasing the side channel hiding areas or increasing the flow velocities. Bank stabilization or levees that alter the natural meander function or reduces overbank flow also result in habitat loss.

The amount of structure is important. Woody debris (which is also a necessary element for fish life history) in a channel can alter flow characteristics in a way to produce scour pools or plunge pools used by fish. Debris upstream of habitat areas can also hold banks together and act as small check dams to meter sediment evenly through the system rather than let it flush immediately to the low gradient areas. Evenly spaced woody structure throughout

the system usually keeps the channel bed at a base level that slows side slope sediment movement. However, too much wood debris in one location can plug the channel and block fish passage. This situation commonly occurred in early logging practices.

The resulting jams led to several decades of stream clearance projects that are still going on in some streams. Sometimes excessive clearing has removed valuable instream functional habitat. The 1970s brought increased awareness that wood is necessary for stream ecosystems. It is accepted today that loss of mature tree canopy along streams and recruited naturally to channels directly influences the distribution and abundance of fish populations and is one of the greatest negative effects of forest harvest (Murphy and Koski, 1989, Hicks et al, 1991).

Sometimes it is important to remove debris that is jamming the flow of sediment or water. This should only be done after extensive watershed-level analysis shows fish passage is blocked, surface water habitat area is reduced or human dwellings could be flooded. If necessary to do so, debris alteration should be accomplished so that escape habitat or channel altering functions are maintained. Remove too much debris and important habitat structure can be lost.

Strategies for restoring and maintaining watershed structure should be included in a watershed-level plan.

Any restoration project to restore stream structure or function should be nested within a larger program of landscape management that protects and maintains natural attributes in a dynamic system. Important structures to maintain in high numbers are:

- Large side-stream trees providing temperature-blocking shade as well as habitat shade and can later recruit to the stream as LWD structure.
- Channel shapes with bottom irregularities that form pools and with

side channel areas that allow escape from high flow velocities. The channel should be deep enough compared with its width to maintain flow velocities that clean and sort gravel and reform irregular channel shapes.

- Undercut banks held by roots that provide escape habitat and vegetation should be protected.
- Fish ladders should be available to provide passage over dams.

3. The rate of recovery in an ecosystem must be measurably greater than its rate of degradation.

When habitat recovery is slow because of repeated disturbances caused by humans, affected fish populations may rebound slowly and even disappear. This is particularly evident where change is locked into place by projects that also alter natural systems. Land conversion to roads, buildings, dams or other long-term fixtures will lower the recovery ability of fish populations and their habitat.

Important watershed processes that are rate driven are delivery of water flow, sediment, fine and coarse woody debris, solar radiation (water temperature) and dissolved substances to the channel. Too much of these inputs can have a negative result and, conversely, too little can result in depleted habitats. For example, stream temperatures above 60 degrees or dissolved oxygen below 10 mg/l can negatively impact fish production. Sometimes a habitat recovery rate can be increased through enhancement projects that grow trees, stabilize bank and place wood structures in the channel. Strategies for improving and measuring recovery rates for habitats (monitoring) should be included in land management plans to mark progress.

4. The natural functioning integrity of a watershed must be protected, maintained and measured by its biological outputs (e.g., fish production).

When biological outputs are hard to measure, important physical characteristics can sometimes be substitute indicators. Of course, measurements of physical characteristics cannot replace biological outputs as a true measure of habitat health, such as fish abundance or macroinvertebrate communities.

Nevertheless, with this in mind, physical products normally associated with salmonid production can be considered indicative of a healthy riverine system that will allow fish to repopulate. For example, a sufficient canopy can often be quantified through temperature measurements, clean gravel by its size distribution, and large woody debris can be counted and its function assessed. Conversely, low numbers of these elements can also be used to estimate the level that a system is impaired. Because instream habitats are so important to fish survival, measuring physical channel attributes are used in many monitoring schemes. The best water quality measurements for fish are dissolved oxygen, temperature and pH.

A watershed may have recovered to the point where important physical elements are in place and situated to provide optimum structure for species life history. However, if the continuity of the life history has been broken so that the population is too low to recover into available habitat, population recovery might not occur. This argues for identifying and providing even higher levels of protection for critical pockets of biological health or fish “refugia” within the watershed so that recovery into renewed habitats can occur. This can be viewed as recovery output rather than production output.

The best land use protection for salmonid populations is protection of a habitat’s functional integrity. For example, sediment introduced to channels at a rate above a level that the system can redistribute it through storm flows could result in reduced available wetted habitat area where the fish need it. The stream literally can flow entirely below a gravel surface during the summer.

As pools are filled and channels widen, it is possible to reach a point where the functional integrity of the habitat is

compromised and biological use (no surface water) for fish is lost. Loss of habitat integrity has happened in cases of sedimentation, temperature increases, water diversions or chemical changes in the worst case scenario of dams, channelization, outfall pollution or watershed disturbance.

Knowledge about the existing watershed condition and the optimum condition that will promote the most positive output is key to compatible land management. As a practice, land management operations that have the least risk and narrowest margin of error are called for when sensitive species could be affected. A land management plan should seek a high level of protection for key elements and their arrangement, and for channel structure (DFG, 1994). The plan should ensure proper habitat function by determining the functional integrity of the system (habitat complexity and biological outputs) and enhance recovery rates through restoration wherever possible. All restorations should have a monitoring plan to assess the effectiveness of protection measures.

Strategies for establishing baseline benchmarks and monitoring the continued functional integrity of the watershed is key to understanding the effectiveness of watershed protection and restoration measures. Appendix B is a compilation of existing studies and other data relating to anadromous fish populations in California prepared by the Department of Fish and Game. Monitoring is discussed more fully in Chapter 6 of this report.

Literature Cited

- Brown, R.F. and B.R. Mate. 1983. Abundance, movements, and feeding habits of harbor seals, *Phoca vitulina*, at Netarts and Tillamook bays, Oregon. NOAA Fishery Bull. 81(2): 291-301.
- Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the north Pacific Ocean. International North Pacific Fisheries Commission. Bull. no. 51.
- Cooper, R., and T.H. Johnson. 1992. Trends in steelhead (*Oncorhynchus mykiss*) abundance in Washington and along the Pacific Coast of North America. Washington Department of Wildlife, Fisheries Management Division. Report No. 92-20. 90 pp.
- Flosi, G. and F.L. Reynolds. 1994. California salmonid stream habitat restoration manual. 2nd edition. Calif. Dept. of Fish and Game.
- Graybill, M.R. 1981. Haul out patterns and diet of harbor seals, *Phoca vitulina*, in Coos County, Oregon. Master's Thesis. Univ. of Oregon. 55 pp.
- Hanson, L.C. 1993. The foraging ecology of harbor seals, *Phoca vitulina*, and California sea lions, *Zalophus californianus*, at the mouth of the Russian River, California. Master's Thesis, Sonoma State Univ. 70 pp.
- Jameson, R.J. and K.W. Kenyon. 1977. Prey of sea lions in the Rogue River, Oregon. J. Mammal. 58(4):672.
- Kesner, W.D. and R.A. Barnhart. 1972. Characteristics of the fall-run steelhead trout (*Salmo gairdneri gairdneri*) of the Klamath River system with emphasis on the half-pounder. Calif. Fish and Game. 58(3):204-220.
- Light J.T., S. Fowler, and M.L. Dahlberg. 1988. High seas distribution of North American steelhead as evidenced by recoveries of marked or tagged fish. (Document submitted to the International North Pacific Fisheries Commission.) FRI-UW-8816. Fisheries Research Institute, University of Washington, Seattle. 21 pp.
- Light, J.T., C.K. Harris, and R.L. Burgner. 1989. Ocean distribution and migration of steelhead (*Oncorhynchus mykiss*, formerly *Salmo gairdneri*). (Document submitted to the International North Pacific Fisheries Commission.) FRI-UW-8912. Fisheries

Research Institute, University of Washington, Seattle. 50 pp.

McEwan, D. and T. Jackson. 1996. Steelhead Restoration and Management Plan for Calif. Dept. of Fish and Game. 216pp.

Pearcy, W.G. 1992. Ocean ecology of North Pacific salmonids. (Washington Sea Grant Program, Seattle), 179 pp.

Pella, J., R. Rumbaugh, L. Simon, M. Dahlberg, S. Pennoyer, and M. Rose. 1991 (in press). Incidental and illegal catches of salmonids in North Pacific driftnet fisheries.

(INPFC Doc.) Auke Bay Laboratory, Alaska Fisheries Science Center, NMFS, NOAA. 48 pp.

Roffe, T.J. and B.R. Mate. 1984. Abundances and feeding habits of pinnipeds in the Rogue River, Oregon. J. Wildl. Manage. 48(4); 1262-1274.

Scheffer, T.H. and C.C. Sperry. 1931. Food habits of the Pacific harbor seal, *Phoca richardii*. J. Mammal. 12:214-226.

Spence, B., Lomnický, G., Hughes, R., Novitzki, R., 1996, An Ecosystem Approach to Salmonid Conservation. 301 pp.

Steele, J., Land Management Practices and Endangered species in the Watershed. Are they compatible? A case history, In Oceans 97 Conference, Post Conference Presentations, 1997.

Steele, J., Stacey, G. Coho Salmon Habitat Impacts. Qualitative Assessment Technique for Registered Professional Foresters. 1994, California Department of Fish and Game, 200 pp.

Stouder, D.J., Bisson, P.A. and Naiman, R.J. Pacific Salmon and their Ecosystems, Status and Future Options.

CHAPTER III

WATER POLLUTANTS AND THEIR SOURCES

Introduction

While the primary focus of this report centers on anadromous fish, water quality protection extends to all waters and all designated uses of those waters. Accordingly, this chapter presents perspectives on water pollutants and their sources.

Designated uses for each water body, such as drinking water, habitat for fish and crop irrigation, must be protected. Protection often extends beyond receptor survival issues, including concerns such as taste, odor and visual aesthetics. Additionally, the water resource itself is to be protected from unreasonable degradation and potential future uses of water must be considered.

The upper limit threshold for pollutants in a water body is dictated by either the most sensitive designated use or receptor, or the need to maintain existing higher quality water. The state's program of protecting higher quality water or the most sensitive use provides an umbrella of protection for all uses, the essence of the multiple species approach called for in Governor Wilson's Executive Order W-159-97.

Risk Exposure Pathway

A common framework for understanding risks from sources to effects is provided in the following risk exposure pathway depiction:

SOURCE ACTIVITY ➤ *STRESSOR*
➤ *MEDIUM* ➤ *RECEPTOR* ➤
EFFECT

This framework is more fully characterized for a sample array of environmental situations in the following table:

SOURCES

Commercial/Industrial
Municipal/Government
Residential/Commercial
Natural Resource Management
Electrical Energy Management
Transportation Systems
Agriculture
Water Management
Recreational Activities

<p>SOURCE AGENTS</p> <p>Fishing Urbanization Farming, grazing, agricultural activities Logging Road building Hatchery operations Regulatory requirements Gravel mining from streambeds Withdrawing water from streams Damming streams Accidental releases Discharging waste water into streams Natural processes such as cyclic variation in oceanic productivity</p>
<p>STRESSORS</p> <p>Noxious Aquatic Weeds Metals Dissolved Oxygen Bacteria Flow Modification Habitat Modification Nutrients pH Sediment Temperature Toxic Substances</p>
<p>MEDIUM</p> <p>Air Land Water Biological</p>

<p>RECEPTOR</p> <p>Humans Fish Plants Birds Trees Animals etc.</p>
<p>EFFECT</p> <p>Decreased populations Decreased species diversity Loss of habitat Physical disruption Shifts in ecological zones Physical impairment Loss of resource</p>

Within this framework risks can be viewed from the top down (sources to effects) or from the bottom up (effects to sources). While this framework presents an easy to understand linear relationship between causes and effects, threats to water quality are not always as easy to depict or understand. Multiple sources that may not individually produce an effect may combine synergistically to effect a receptor. Conversely, multiple sources may buffer or cancel the stress caused by each source acting independently.

Water Quality Assessments

Every two years, the State Water Resources Control Board (SWRCB) prepares a report on the quality of the state's waters. The report provides water quality information to the public and serves as the basis for EPA's National Water Quality

Inventory Report to Congress. Water quality assessment information compiled from the nine Regional Water Quality Control Boards (Regional Boards) was last presented in the 1996 California 305(b) Report on Water Quality.

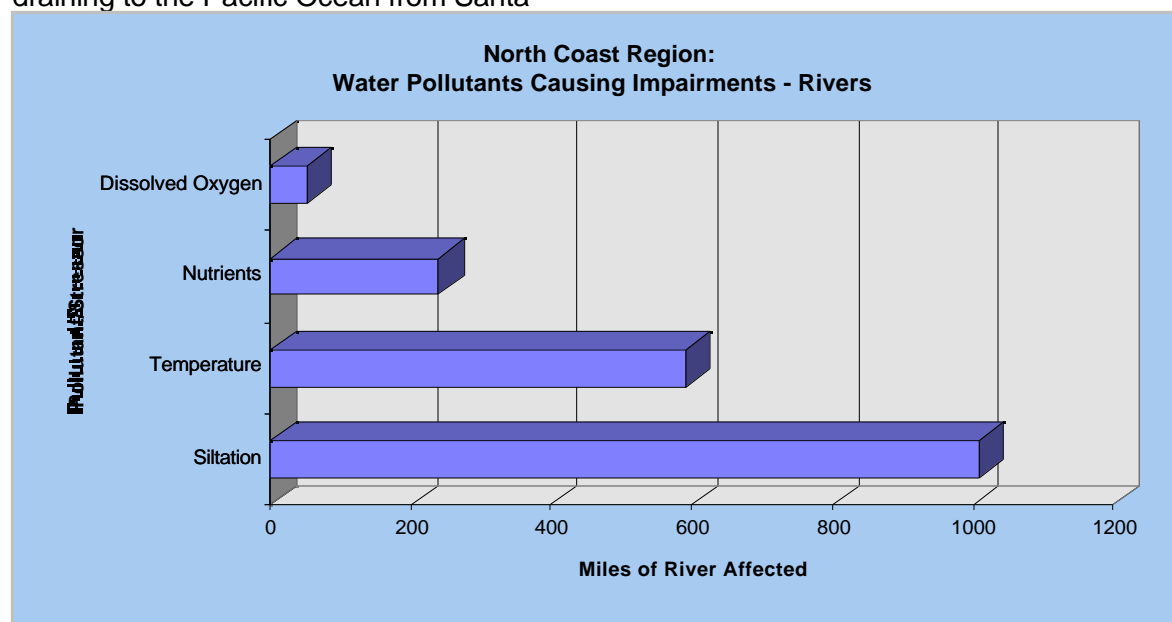
The 1996 305(b) Report also presented the state's most impaired waters as listed under Section 303(d) of the Clean Water Act (CWA). For these waters, the CWA requires the development and implementation of waste load allocations in the form of Total Maximum Daily Loadings (TMDL) -- the prescription of amounts of pollutants allowable from each activity in the watershed of an impaired water.

That portion of the report corresponding to Section 303(d)-listed waters in coastal basins where anadromous fish are a concern warrants discussion. Most of these basins are regulated by three Regional Boards (North Coast, San Francisco Bay and Central Coast) and include all waters draining to the Pacific Ocean from Santa

Barbara County to the state of Oregon (a portion of the Los Angeles region also provides habitat for anadromous fish).

Pollutants

Figures 3-1 through 3-5 provide an overview of the pollutants causing impairments in each of the three regions where anadromous fish predominate. The figures include pollutants causing impairments of all beneficial uses, not just anadromous fish. Please keep in mind the different scales (both for miles and acres of waters affected) from region to region. For an overall assessment of water quality conditions in the state, refer to the 1996 California 305(b) Report on Water Quality.



Note: An additional 1011 acres of estuaries are impaired by nutrients.

Figure 3-1. North Coast Region: River Impairments

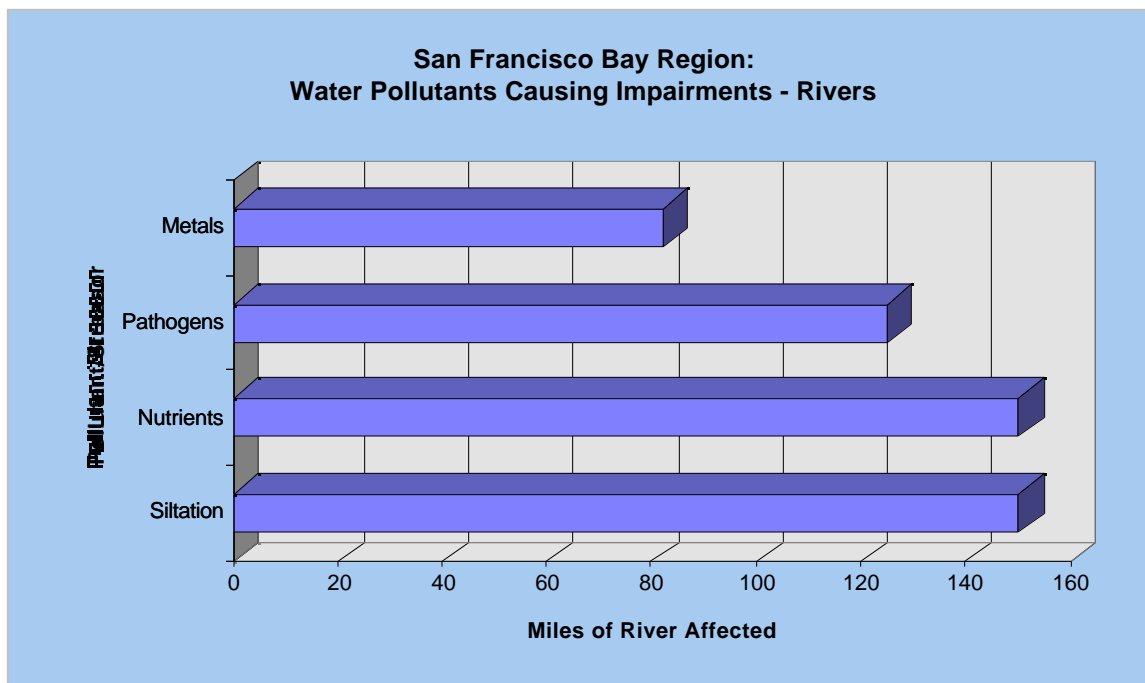


Figure 3-2. San Francisco Bay Region: River Impairments

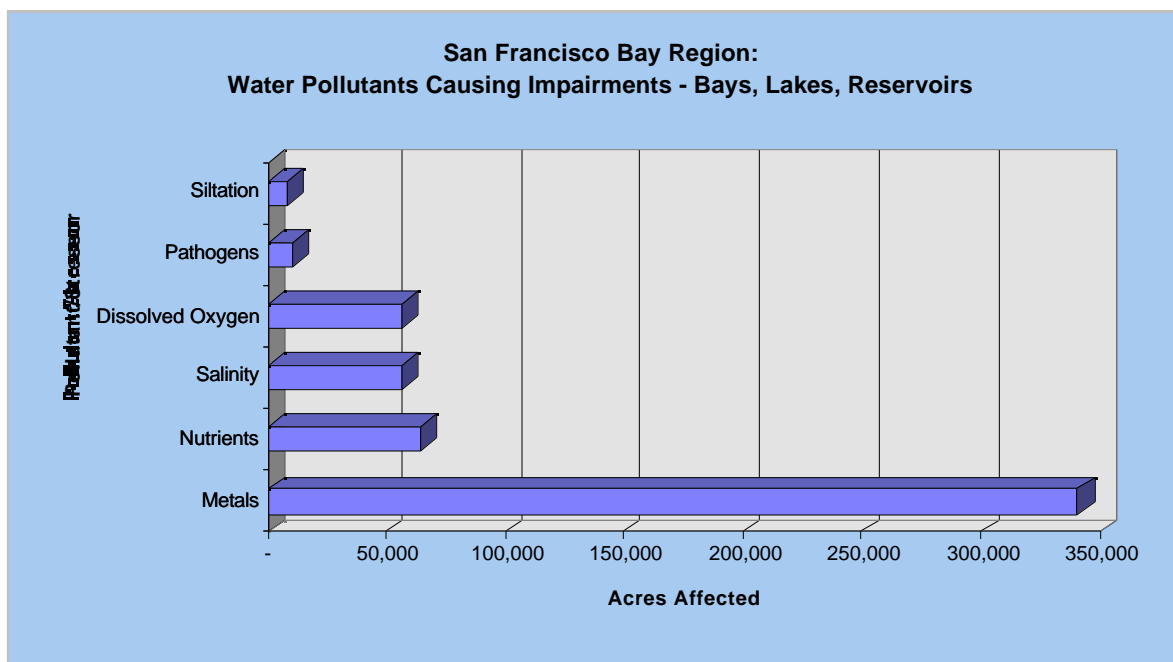


Figure 3-3. San Francisco Bay Region: Bay, Lakes and Reservoir Impairments

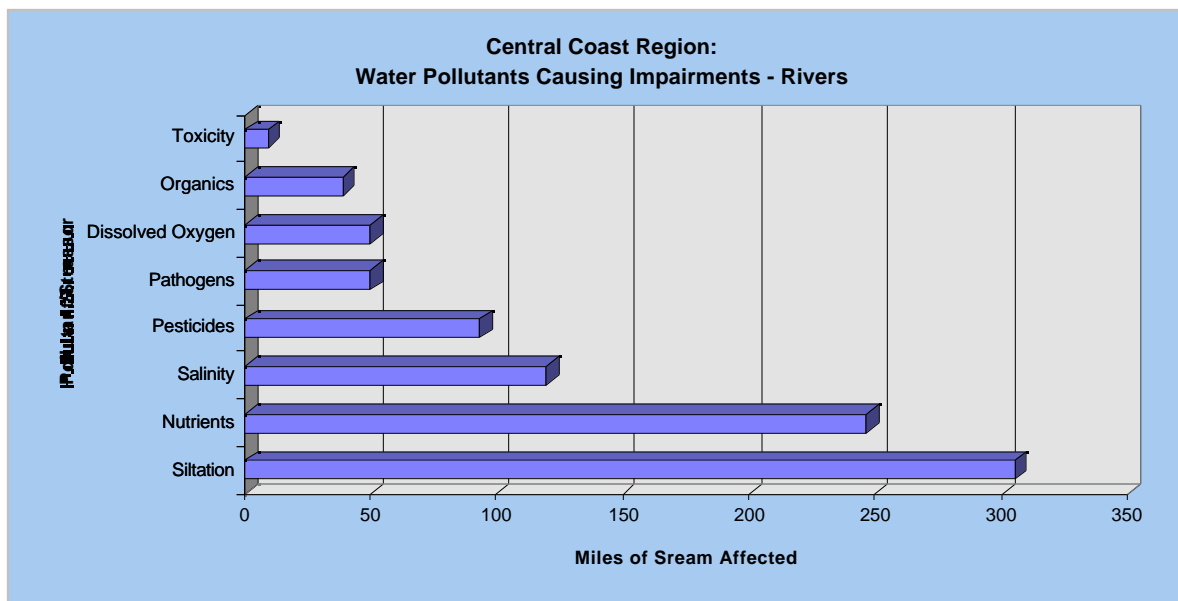


Figure 3-4. Central Coast Region: River Impairments

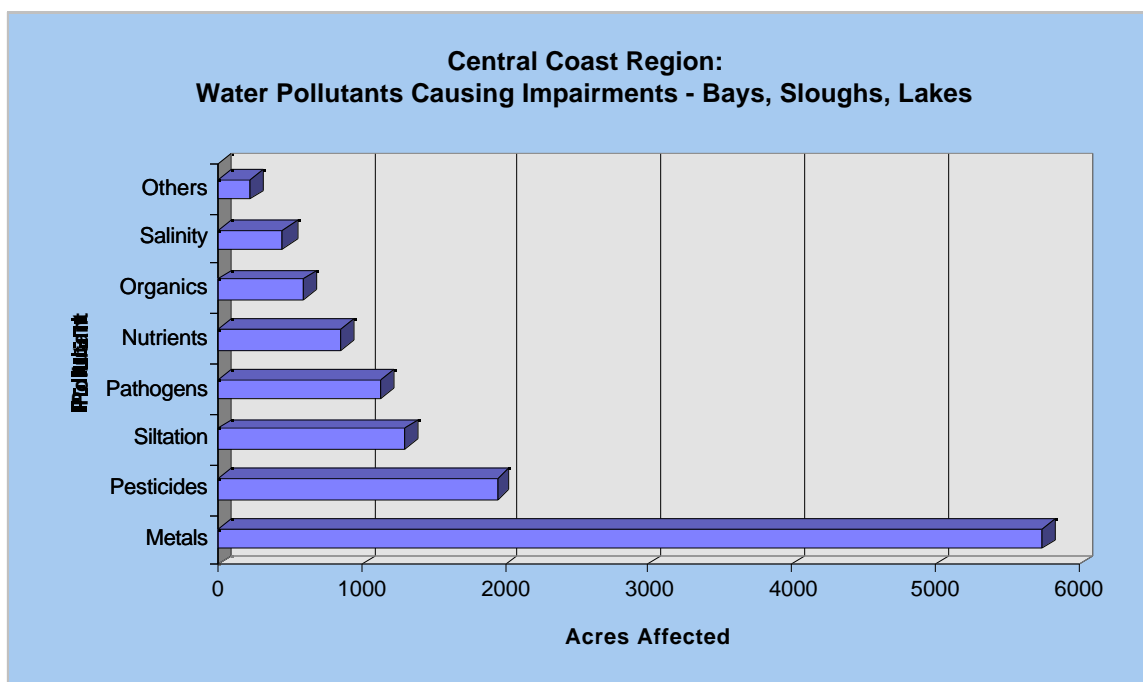


Figure 3-5. Central Coast Region: Bay, Sloughs, and Lakes Impairments

As can be seen in the three regions, there are distinct differences in the composition of pollutants causing water quality problems from region to region and from rivers to lakes within a region; for example, the temperature problems in North Coast rivers are unique to that region. There are also

some commonalities. For example, siltation is the most frequently encountered pollutant in rivers, and metals is most common in bays and lakes. Figure 3-6 presents a compilation of all pollutants causing impairments in coastal basin rivers in the three regions.

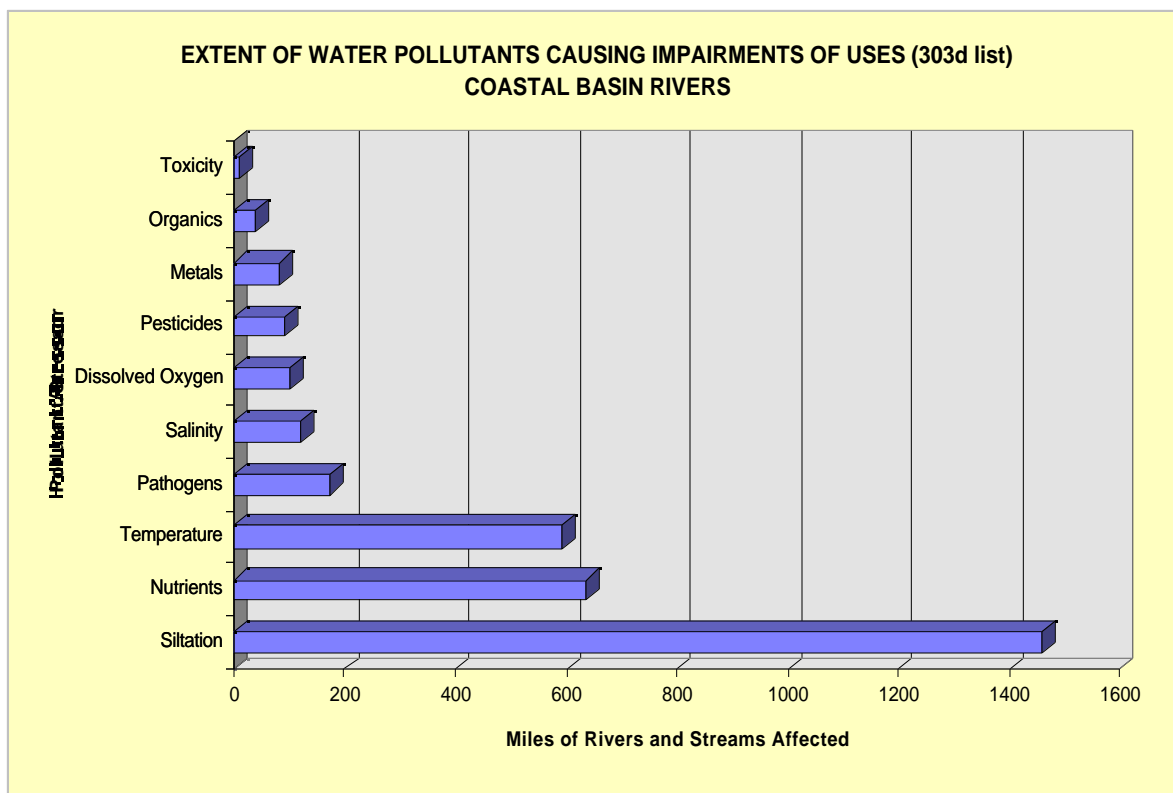


Figure 3-6. Water Pollutants or Stressors Causing Impairments in Coastal Basin Rivers

Sources of Impairments

Identification of the probable sources of a pollutant/stressor causing an impairment is available in the 305(b) report. However, as multiple sources are often listed for a specific impairment, it is difficult to present a graphical interpretation of the extent or importance of impairments attributed to a specific source. It is this very challenge that the TMDL process addresses - determining the contributions from each source and allocating a wasteload. Absent the specifics, only a generalized picture can be drawn of the sources causing impairments.

The following table lists the number of times a general category of sources (undistinguished as a singular activity or in combination with other related activities) were cited as causing or contributing to an

impairment of the 83 waterbodies on the 303(d) list:

Agriculture	35
Nonpoint Sources (unknown)	31
Municipal/Industrial	25
Urban runoff	24
Mines	20
Forestry	17
Animal Confinements/Grazing	15
Land Development	14
Septic systems	9
Others (boats, hydro modifications and waste piles)	<u>12</u>

Total number of sources cited: 202

Although watersheds along the north coast are highly unstable and subject to erosion under natural conditions due to the erodibility of underlying geologic units and seismic activity, the pollutants and sources causing many of the water quality problems in these

coastal areas appear to be associated with land management practices. It is somewhat ironic that as water quality concerns have progressed to highly technical and complex issues, the solution to many significant water quality problems continues to be relatively straight-forward -- keeping soil in place.

Water Quality Factors Contributing to the Decline of Anadromous Fish

As summarized in Figure 3-6, the most problematic pollutants or stressors in order of occurrence are siltation, nutrients, metals, pathogens, salinity, depressed dissolved oxygen levels and organics. These pollutants and conditions have their greatest affect on the most sensitive receptors and uses: fish and their habitat and people and their drinking water.

California has designated anadromous fish passage, salmonid fish spawning and rearing, and resident fish and aquatic life as beneficial uses to be protected in coastal basins. To protect these and other beneficial uses, the state has also adopted specific numeric and narrative criteria that address thermal conditions (temperature), chemical parameters (e.g., dissolved oxygen, pH, toxic substances), physical conditions (e.g., sedimentation) and biological conditions. All of these standards work together to provide the thermal, chemical, physical and biological conditions anadromous fish and other aquatic life require to survive and thrive in coastal water bodies.

Background on Factors for Decline

The water quality factors that have contributed to the decline of anadromous fish in coastal basins have been identified based upon water quality monitoring data, observations and the professional judgment of State agency staff. Not all identified factors for decline contribute equally to the decline of coastal salmonids. A review of these factors follows.

Siltation

Gravel beds in a number of coastal streams used by salmonids for spawning, incubating and emerging fry have been filled or covered by excessive sediment due to high sediment loads. High sediment loads can also adversely affect fish by: increasing mortality; reducing growth rates; causing physiological stress; impairing homing instincts; and reducing feeding rates. High levels of sediment also can produce changes in channel structure and habitat by reducing pool frequency, depth and volume. Excessive sediment loads may result from factors such as degraded riparian areas and stream banks, erosion from agricultural lands, landslides, construction and maintenance of state, local and forest roads, and other land disturbing activities.

Changes in sediment supply and routing dynamics can potentially have several detrimental effects. Excess sediment supply overwhelms the sediment transport capacity of a given stream reach can lead to channel aggradation, instability and widening. Excess sediment over transport capacity can also fill in pools. Excess fine sediment supply (material the size of small sand and smaller) can lead to the intrusion of fines into coarser particle beds, which can decrease aquatic insect production and possibly decrease egg to fry survival of salmonids.

Nutrients

Excessive nutrients in water bodies can result in growth of algae which in turn causes large diurnal variations in dissolved oxygen levels. Conversely, concerns have been expressed that there are inadequate nutrients in smaller streams due to the loss

of salmon carcasses as fewer and fewer salmon return to natal streams to spawn. Deviation from natural conditions of nutrient loading alters primary production, algal growth and ultimately the type and quality of food available to salmon. Nutrient loading may be reduced due to reductions in salmon carcass input that provides unique nutritional value to juvenile salmonids, or increased as a result of added loads of nitrogen and phosphorus from activities such as fertilizer use and waste treatment plant discharges.

Dissolved Oxygen

Dissolved oxygen levels are too low to adequately support salmonids in some coastal water bodies due to high biochemical dissolved oxygen demand (BOD) and nutrient loads from point and nonpoint sources.

Temperature

Water temperatures are too warm for anadromous fish in many coastal streams. Altered water temperatures can adversely affect spawning, fry emergence, smoltification, maturation period, migratory behavior, competition with other aquatic species, food supply, growth and disease resistance. Altered water temperatures may occur due to factors such as: riparian canopy removal; water impoundment; water withdrawal; water discharges (such as irrigation return flows and point source discharges); and changes in channel morphology such as widening and/or reducing the depth of stream beds. The amount of thermally altered habitat is not known. However, based on the extent of water impoundments, riparian canopy alteration, heated discharges, and channel changes, the affected habitat area is likely large.

Flow Modification

The reduction of natural stream flows by removal of water for out of stream uses is a significant concern where it impairs water quality and salmonid habitat. Reduced flows result in increased water temperature, reduced flushing of systems and may exacerbate other water quality problems. Studies show that excessively reduced flows provide less habitat for fish and may result in increased aggression, competition, or predation. Altered flows can also affect fish migration.

pH

Elevated pH levels that may adversely effect salmonids have been observed in some coastal streams. These levels may be due to factors such as: excessive algal growth attributable to nutrient loading from point and nonpoint sources; wide, shallow stream beds due to sediment inputs; and altered riparian vegetation that allows increased solar radiation to reach water bodies.

Pathogens

The bacteria water quality standard is designed to provide an indicator of potential human health problems from fecal contamination. It is of particular concern in coastal estuaries for the shellfish industry because there are federal FDA limits that must not be exceeded in shellfish growing waters. Bacteria, as measured by this water quality standard, is not considered to be a factor for decline of salmonids. However, it can be an indicator of problems with discharges from Confined Animal Feeding Operations (CAFOs), or sewage treatment plants.

Toxics

Toxic substances can adversely affect aquatic life and aquatic habitat. Potential adverse effects include acute or chronic toxicity, bioaccumulation in sediments and aquatic life, behavior modification and

reduced growth, reduction of habitat and/or food, genetic alterations, and reproductive effects.

Habitat Modification

Modification of habitat such that aquatic species are impaired is documented in the 303(d) impaired water body list.

Loss of Wetlands

Due to human activities, many coastal wetlands have been filled, disconnected from streams or otherwise altered, resulting in decreasing rearing and over-wintering habitat and diminishing other wetland functions important to salmonids, such as storm water storage and filtration.

Wetlands provide important habitat for salmonids. Wetlands may also function as important regulators of stream flow and often provide key habitat for beavers (that may provide instream habitat). Other wetlands have been isolated from their associated streams by roads or other improvements. Diking, draining and filling are the most common activities that have changed the abundance and quality of wetlands.

CHAPTER IV

PROTECTION PROGRAMS

Introduction

Anadromous fish have declined to a small fraction of their historic abundance in California because of a number of human activities, the legacy of many circumstances over a broad scale of space and time. Voluntary actions and regulatory programs to protect anadromous fish in California also have evolved over time. As understanding of the controllable factors causing problems has increased, California has responded, often through regulatory controls, albeit at a relatively late stage in the development of this crisis.

This lag in deploying protection measures, coupled with the increasing importance of restoration measures and uncontrollable natural events, makes the overall assessment of the effectiveness of protection programs a challenging task. Regardless, benefits will accrue as protection programs are improved; problems will be prevented, the value of natural resources will be enhanced and the fruition of restoration efforts will be assured.

This chapter describes California's anadromous fish protection programs, regulatory and voluntary, as well as statewide and local. Discussion centers on the types of human activities of concern. Components of various regulatory programs have been merged in the text to provide a comprehensive accounting of protection measures in place for specific activities.

Regulatory programs which have overarching effects on several activities,

such as those specifically dedicated to the protection of fisheries and the control of invasive species and pesticides, are discussed separately. Voluntary programs, especially those located in watersheds, are too numerous to credit and a mere sampling is included, as well as an appended listing. These programs combined represent a body of sufficient regulatory authority to protect anadromous fish in California and a growing legion of watershed-based sponsors and supporters of protection efforts.

Existing Statewide Regulatory Programs

Protecting Fish and Their Habitat

The Department of Fish and Game (DFG) is the primary agency responsible for oversight of the state's diverse wildlife resources. Many activities are devoted to hunting and fishing programs. DFG also owns lands as wildlife refuges. As other agencies have permit processes associated with water quality and water rights issues, DFG activities are often focused on understanding and assessing natural resource populations and then coordinating with and advising permit agencies. Specific protection activities of DFG include review of California Environmental Quality Act (CEQA) projects, California Endangered Species Act (CESA) consultation, streambed alteration agreements, pollution investigation and spill response, and mitigation measures.

Review of CEQA Projects

DFG functions in a dual role in the CEQA review process that regulates projects with potential for environmental impacts. DFG serves as a technical consultant on fish and wildlife matters. In response to an agency, consultant or public request, DFG provides natural resource data or advice on aquatic and terrestrial wildlife (mostly native and some introduced plants, fish, amphibians, reptiles and mammals). This is usually done to understand the impacts from pending projects and prevailing environmental conditions, and to develop recommendations for protecting fish and wildlife resources. DFG also serves during the project review process, when required by CEQA, as the official trustee advocating for wildlife resources belonging to the people of California.

The CEQA project review process was established to comply with CEQA public hearing requirements and multi-agency review. Projects reviewed include water appropriations and water rights permits, timber harvesting plans, dams, stream crossings and construction projects. This project review allows all state departments to maintain liaison with federal and state agencies and participate in the Fish and Wildlife Coordination Act, National Environmental Policy Act, Clean Water Act, State Water Code, federal and state Endangered Species Acts, CEQA, Forest Practices Act, Fish and Game Code and other administrative and public resource codes.

DFG reviews projects described in an environmental impact report (EIR) for potential impacts to aquatic and terrestrial wildlife and provides protection and mitigation comments to the lead agency through written or verbal response in the public hearing. In addition, DOC's Office of Mine Reclamation addresses stream conditions in the review of Mined-Land Reclamation Plans; DMG addresses mineral resources in instream channels in CEQA documents and soil resources, erosion and

slope stability factors impacting streams during Timber Harvesting Plan (THP) review and in CEQA documents; the California Department of Forestry and Fire Protection (CDF), the Regional Water Quality Control Boards (RWQCB), and other including DOC's Division of Land Resource Protection (DLRP) also addresses the four factors listed below. This process works best when sufficient information is supplied with the EIR.

The EIR, written by the project proponent, is a project disclosure document which all agencies review for the following:

- 1) The project setting and location.
- 2) The resources that might be at risk from the operation (particularly those that are not specifically protected by established protective rules).
- 3) The significant cumulative effects from the project that add to those of past projects and expected future projects.
- 4) Additional mitigation measures or project alternatives added to lessen impacts below the level of significance.

The cumulative effects evaluation is usually limited by mutually-agreed boundaries. The perimeter is sometimes along the watershed or drainage boundary, or within the affected area of a species.

California Endangered Species Act (CESA) Consultation

DFG also functions within both roles described above when consulting with agencies pursuant to CESA consultation requirements outlined in Section 2090 of the Fish and Game Code. A request by a lead agency for consultation is mandatory whenever the project has the potential to adversely impact a state-listed threatened or endangered species.

CESA is a safety net for species that are threatened due to habitat loss, exploitation or

other human causes. Project evaluation under CESA requires a specific analysis of potential impacts not offset by other legal requirements that add focused protection measures. This protection is accomplished by consultation with experts on the life history needs of the species. A completed consultation results in a letter from a DFG regional manager or the director to the lead agency describing agreed protection measures.

Summary of the CESA consultation process:

- 1) Notification – Other agencies or project planners are required to notify the appropriate DFG regional office when there is a potential for impacts to a listed species.
- 2) Project Review – DFG reviews the proposed project and the life history requirements of the species and determines the potential risk to individuals or populations of the species.
- 3) Consultation – Field biologists meet with the agency and applicant to discuss project details, determine species data protocol needs and develop a framework for a draft memorandum of understanding (MOU).
- 4) Mitigation – A draft CESA MOU with mitigation as agreed in the consultation is forwarded through a DFG surname and signature process for policy and biological agreement and consistency.
- 5) Project agreement – If securities, endowments or other special agreements are necessary, the applicant must sign the MOU. Otherwise, incorporation of the MOU agreement in the project is considered commitment by the applicant and lead agency. Consultation for projects or operations that do not require an EIR is still required if a listed species could be impacted.

DFG can also consult and develop agreements directly with the project proponent (or landowner) under Section 2081 (Section 2090 is restricted to state lead

agencies). These agreements can cover all of the projects anticipated over time on an owner's property and follow the same general process as above. An advantage of this multi-project approach stems from the longer time frame of the protection measures and can take into account losses of protected individuals that do not affect the viability of the population. By following conditions of the agreement to protect the population, a landowner does not have to be concerned about violating CESA if individuals of the listed species are lost incidental to the project (e.g., accidentally destroying a nest during site preparation). An application for a 2081 agreement is made by writing to the appropriate regional manager. A Section 2081 agreement must provide conservation, preservation, recovery and enhancement measures for the species.

Through interagency agreement, DFG may act on behalf of the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) when consultation is necessary under the federal Endangered Species Act (ESA). Each project is coordinated with the appropriate federal agency for their analysis and input. DFG does not specifically act as agent for the federal agency, but can carry out consultations and wardens may enforce federal law. Whether the federal agency becomes involved is decided on a case-by-case basis by its review of the project proposal.

Streambed Alteration Agreements

Whenever a project proposes to alter a streambed, channel or bank, an agreement with DFG is required. The agreement is a legally binding document that describes measures agreed to by both parties to reduce risk to fish and wildlife in the stream system during the project. The extra focus to stream protection brought by this code is necessary because of the valuable fishery resources that are highly sensitive to stream alteration activities.

This is a separate process from CEQA approval but is usually determined at the

same time, depending on the project proponent application. Agreements typically have less procedural and legal requirements than CEQA in order to work with small-scale projects that are important to fish. Time frames for agreements are 30 days for DFG to respond to a request (that includes project plans) and begin discussions.

Pollution Investigation and Spill Response

DFG wardens and specialists are trained and authorized to investigate spills of oil-based liquids and toxic chemicals in wild lands and waterways. A pollution investigation laboratory is available to assist in chemical identification and tracking. Pollution cleanup materials are warehoused for response crews. Civil penalties, compensation for losses and costs for cleanup can be sought.

Mitigation Measures to Protect Species

Mitigation measures for the above programs are recommended by DFG, based on the best available information. They must be consistent with protection for a species that could respond negatively to the proposed project and would recover slowly. Typical recommendations are made on a site specific, case-by-case basis to avoid or buffer key areas, protect key components (which speeds recovery), or to change construction time frames to allow nesting or other life requirements. Special protections for fisheries include protecting key habitat elements, leaving shade for habitat and keeping temperatures low in watercourses, screening water diversions and reducing sediment inputs or direct disturbance to the bed and banks.

Projects that propose to significantly modify habitats, remove key habitat components, destroy unique areas or disturb necessary

life functions of sensitive species usually result in a finding that additional information, mitigation or project alterations are needed. Intensive land management usually requires a higher level of information regarding any species at risk in order to focus mitigation measures effectively.

When these recommendations affect the proposed project or operation, project proponents may suggest project alternatives that maintain their operational goals and still reduce environmental impacts. This process sometimes unavoidably extends the EIR review time frames, particularly if information must be gathered to ensure protection for ESA protected species.

Angling

In 1991, there were an estimated 99,700 steelhead anglers in California. It is estimated that sport fishing revenues could generate an additional \$37.5 million per year to the state's economy if California's steelhead populations are doubled.

Ocean fishery restrictions on coho salmon have been in place since 1993. These restrictions, including releasing all coho contacted and structuring fishing seasons to avoid coho concentrations is continuing. DFG will continue to recommend to the Fish and Game Commission the inland closures of recreational fisheries where naturally produced coho can be adversely affected. Many inland stream areas are already closed to the take of coho; many others are closed to all fishing.

Limited information on steelhead sport harvest rates does not suggest that over-exploitation of wild stocks is occurring on a widespread basis. A statewide selective harvest regulation or an annual bag limit may not be warranted, but it may be considered by the California Fish and Game Commission.

Hatchery Operations

Hatcheries can potentially affect natural fish production if hatchery fish use the natural environment for extended rearing following release from the hatchery (competing with wild fish) or if the adults spawn with naturally produced adults. Also, large hatchery fish returns can encourage catch-and-release fishing which can result in mortality of incidentally caught naturally produced fish. Hatcheries can also harbor diseases.

California, through its Fish and Game Commission and its Department of Fish and Game, has worked to manage hatcheries so they do not interfere with natural production. Hatcheries in California have generally not been to augment natural production, rather they have been generally designed and managed to mitigate habitat lost to dams or other human activities.

The Department shall continue its long-standing hatchery management practices that minimize adverse interactions between hatchery and naturally produced native fishes. These include, but are not limited to, prohibition on stocking of resident fish in anadromous waters; only releasing anadromous salmonids at times, sizes, and places that minimize interactions with naturally produced native fishes; and only releasing hatchery fish that are determined by Department pathologists to be healthy and to pose no threat to naturally produced native fishes of the area.

The Department has encouraged NMFS to provide comments about hatchery programs, with any concerns to be resolved between NMFS and the Department.

Control of Predatory Species

Predation and other forms of interspecific competition in modified environments may be a major factor affecting salmon populations in some aquatic systems. Dams have increased flows in normally low-flow

months and increased some predators such as northern squawfish (*Ptychocheilus sp*) populations which prey on juvenile anadromous fish. Warmer summer waters from lack of stream shade have increased the numbers of warm water-tolerant fish such as sunfish species, hardhead, squawfish and roach. Substrate changes, such as riprapping banks, have favored some species (e.g., squawfish and sunfish in the Sacramento River system) that out-compete or prey on salmonids.

A variety of exotic predator and prey species have been introduced purposely and accidentally in California stream and lake systems. Results of these species composition modifications have varied greatly depending on the vulnerability of anadromous fish in the local situation, but few have been positive. There have been elimination or reduction of native species that salmonids use as prey, predation on salmonids, and introduced prey species not available for salmonids because of timing or location.

Warm water fish have been increasingly apparent in coastal streams, and their impact on salmonids, while intuitive, remains largely unstudied. However, some changes have been suggested for coastal waters, such as increased shade and lower summer flows below dams such as the Eel River system. Brown and Moyle (1981) reviewed available literature and suggested that squawfish may prey extensively on young salmon in lakes, but there is little evidence that predation has much impact on the number of returning adults in a natural stream system. This may reflect the lack of attention to this issue in studies rather than lack of impact. Some evidence found by Brown and Moyle indicate that highly localized, seasonal or unusual habitat situations produce evidence that predation and interspecific competition occurs. The low power of the evidence may be a function of the lack of study tools and focus and suggests that research should continue. (Brown, L.R. and P.B. Moyle (1981). "The impact of squawfish on Salmonid population: A review" in North American Journal of Fisheries Management 1(2):104-111.)

Authority

DFG authority for fishery protection is provided in the following regulations:

- Streambed Alterations (Sections 1601-1607, Fish and Game Code)
- Pollution (Sections 5650-5652, Fish and Game Code)
- Protection of Fish Spawning Areas (Section 1505, Fish and Game Code)
- Removal of Pollutants (Section 1201.5, Fish and Game Code)
- Wild and Scenic Rivers Act (Sections 5093.50-5093.69, Public Resources Code)
- California Wetlands Preservation Act (Sections 5810-5818, Public Resources Code)
- Conservation of Aquatic Resources (Section 1700, Fish and Game Code)
- Native Species Conservation and Enhancement (Sections 1750-1756, Fish and Game Code)
- Wildlife Conservation Law of 1947 (Section 1301, Fish and Game Code)
- Conservation of Wildlife Resources (Sections 1800-1801, Fish and Game Code)
- Native Plant Protection Act of 1977 (Sections 1900-1913, Fish and Game Code)
- Salmon, Steelhead Trout, and Anadromous Fisheries Program Act (Sections 6900-6924, Fish and Game Code)
- Fully Protected Birds (Section 3511, Fish and Game Code)
- Fully Protected Mammals (Section 4700, Fish and Game Code)
- Fully Protected Reptiles and Amphibians (Sections 5000-5050, Fish and Game Code)
- Fully Protected Fish (Section 5515, Fish and Game Code)
- Porter-Cologne Water Quality Control Act (Sections 13000-13951, Water Code)

Implementation and Follow-up

DFG often seeks project compliance monitoring and sometimes effectiveness monitoring to be included in CEQA or CESA

projects, depending on circumstances. Staff is sometimes available for monitoring oversight. Fish population and habitat trend evaluations are ongoing through stream evaluation crews.

Protecting Instream Flows

Water rights law is a body of state constitutional, legislative and judicial law that governs the diversion of water for use. The State Water Resources Control Board (SWRCB) has jurisdiction over all water diversions related to the reasonable uses, reasonable methods of use and reasonable methods of diversion. The SWRCB has permitting authority over appropriative water rights issued since 1914 for surface water and diversions from subterranean streams. The SWRCB does not have permitting authority over the pumping of percolating groundwater, diversions by riparian water users nor water rights that were initiated prior to 1914.

Three elements in the execution of the water rights program affect environmental conditions for anadromous fish: permit issuance, permit revisions and water quality certifications under section 401 of the Clean Water Act (CWA).

Issuance of Water Right Permits

Diversion of surface water requires prior approval from the SWRCB if the water is to be used on lands other than those adjacent to the stream (and covered under riparian rights) or the appropriation commenced before 1914 (pre-1914 rights). When an application is completed, downstream water users and interested parties, including DFG, receive notice. Parties are allowed to file protests against the application. If the protest is valid, it is accepted and the applicant attempts to resolve the protests. If the protests are resolved, a permit can be issued once the SWRCB has complied with the provisions of California Environmental Quality Act (CEQA) discussed below. If the

protests are not resolved, a field investigation (for small projects) or a water right hearing (in the case of large projects) is held to decide if water is available for appropriation. This involves the development of permit conditions necessary to protect prior rights, fish, wildlife and the public interest. Unlike water quality matters, water right hearings are quasi-judicial with the SWRCB acting as the judge. If the project is approved, a permit is issued. The permit allows the development of water to occur over a specified period of years. Once that time has expired, the permitted project is inspected and a license is issued if the permittee has complied with the provisions of the permit.

Water right permits are typically only inspected once, at the time of license. A water right permit is similar to a property right; it can be transferred, leased, bought or sold. Some of these transfers may require SWRCB approval. Approval of these transfers is discussed in the section on change petitions below.

Authority

SWRCB authority for water rights is contained in the California Water Code, Division 2.

The public trust doctrine has its roots in English Common Law. It was further defined by the California Supreme Court in 1983 in the Audubon decision (33 Cal. 3d 419, {189 Cal. Rptr. 346} cert. denied, 464 U.S. 977) to require the SWRCB to continuously supervise the public trust interests affected by water diversions (including fish and wildlife) and protect these uses in the public interest where feasible. This has meant correcting past decisions that did not appropriately protect public trust resources. The SWRCB took such action in its 1994 Mono Lake water right decision. The public trust doctrine recognizes that there may be instances where complete protection of public trust resources is not feasible.

Implementation and Follow-up

Before a water right permit can be issued, the SWRCB must find that unappropriated water exists. In determining the amount of water available for appropriation, the SWRCB must first determine the amount of water that needs to remain in the stream for the protection of beneficial uses, including fish and wildlife (WC Sections 1243 and 1243.5). This determination sometimes requires balancing instream uses with the out-of-stream uses requested by the applicant.

The SWRCB must comply with the provisions of CEQA before it can issue a water right permit. This requires an evaluation of the likely environmental impacts of the project and the proposed mitigation measures to avoid or reduce impacts below the level of significance. Most of the projects that are processed by the SWRCB are small projects. Many of them do not pose significant risks once standard or special permit terms are incorporated into the permit. Some of these may be processed as exemptions. Others need negative declarations and still others require mitigated negative declarations. In each case, the impacts are evaluated and terms are developed that mitigate environmental impacts to less than significant levels. Only when an EIR is prepared can the SWRCB make findings of overriding considerations that may allow a project that has environment impacts to proceed.

A water right permit allows the water user to divert water and develop the full and beneficial use of water over time. Once that time has run out the project is inspected for compliance with the permit terms and a license is issued. This inspection occurs once during the life of the project. If at the time of the license inspection the permittee is not in compliance with the terms of the permit, the permittee is given an opportunity to correct the situation. This can be done through modifying the project operation, construction action to eliminate any unauthorized diversion of water, providing the monitoring or reports called for in the permit or filing for a water right change petition to modify the water right to be consistent with the project as developed.

The SWRCB does not currently have sufficient resources for an effective compliance field presence. Compliance is through the licensing activities discussed above or through action on complaints filed by individuals. The SWRCB investigates these complaints and takes actions to bring the parties into permit/license compliance. Enforcement options for permittees and licensees include the issuance of cease and desist orders or going to court to seek injunctive relief. Any unauthorized diversion (or trespass as set forth in the law) is subject to a maximum administrative civil liability (ACL) of \$500 per day for each day of unauthorized diversion or use of water (WC Section 1052). This applies to licensees, permittees and any other unauthorized use of water. The section of the water code that allows the use of ACLs is relatively new and has been used increasingly in recent years to encourage compliance with the water laws of the state.

Revision of Permits and Licenses

Changes to water right permits and licenses are sought for many reasons. Permits may need modifications based on changes in the types of end uses of the water. For example, water exclusively used for farming operations in the past is now being used to satisfy the growing population in many areas, especially the Central Valley. New, more efficient points of diversion may be identified or needed to service new areas of use. Due to changing demographics, the place of use for the water sometimes changes from that projected when the water rights were granted. Also, some water right holders have water that they may be able to sell to other users in different areas of the state. These short- or long-term transfers of water are one mechanism to satisfy water demand without the immediate need to construct new water projects. These transfers also provide alternatives for distributing water during water-short periods for critical needs.

Authority

Changes to the purpose of use, place of use or point of diversion are allowed in a permit or license provided they do not injure any other legal user of water (Water Code Sections 1701, 1702, 1725 and 1435). Transfers to dedicate flows for instream and wildlife uses are also allowed under water code section 1707. The SWRCB exercises its public trust responsibilities when considering change petitions. However, a change petition cannot be used to expand the quantity of water granted in the permit or license. Requests to increase the amount of water must follow the water right application process.

Implementation and Follow-up

Change petitions are publicly noticed. However, change petitions to accomplish a water transfer are processed under special expedited processes set forth in the water code. In each instance, the SWRCB must make findings that the change will not injure any legal user of water and not unreasonably affect fish or wildlife. Water transfers that involve conserved or stored water are exempt from the provisions of CEQA. All other transfers and change petitions are subject to CEQA.

During the change petition review process, the potential effects of the change to the project are analyzed. This change in the project is the focus of the environmental review under CEQA and the water rights review. Many of the protests received relate not to the change in the project, but to the project itself. The SWRCB's position on these protests is to reject them and to suggest the protestant file a water right complaint with the necessary supporting documentation. The SWRCB believes that the in-depth review of the operations of existing projects should be based on the need to update the permit terms rather than when a change to a project is needed. The SWRCB's continuing water right authority and public trust responsibilities allow the SWRCB to reopen permits and licenses whenever conditions warrant. Such efforts are time consuming and need to be supported by information that clearly shows operational changes to the project are necessary to

protect prior rights or public trust resources. However, where there is a clear nexus between the change petition and the existing environmental concerns (e.g., a change in the point of diversion of an unscreened diversion), then the change petition process may be the appropriate place to resolve these outstanding issues.

Specific Measures to Protect

Anadromous Fish and Habitat

Currently, specific measures to protect fish are developed on a case-by-case basis. Often, the SWRCB does not have good specific studies to determine the flows needed to remain in the stream to protect fish habitat or the flows necessary to maintain the fluvial processes of the stream system. For large projects this type of information is developed through specific stream studies conducted during the environmental review process. However, these studies are expensive and beyond the financial means of applicants seeking permits for smaller water diversion projects. In these cases the SWRCB depends upon the best professional judgment of the DFG and other experts to develop instream flow bypass terms to protect the stream system and fish habitat. Fish screens are typically required on new water diversion projects in cold water fishery streams. Offstream water storage projects are encouraged over onstream storage projects to reduce the need to provide expensive fish passage facilities, such as fish ladders. As stated above, approval of change petitions requires either the completion of the CEQA review process, a finding that the change will not unreasonably affect fish and wildlife or both. The “no unreasonable effect” test is not as stringent as the “no significant effect” test required to qualify a change petition for an exemption or negative declaration under CEQA.

While the environmental effects of change petitions are often much less than those for a new water right, the more dramatic the change from the original project, the more likely the possible environmental effects. In each instance, these effects and conditions

to mitigate them are evaluated on a case-by-case basis.

Protecting Water Quality

The SWRCB and the Regional Water Quality Control Boards (Regional Boards) are the principal state agencies responsible for coordinating and controlling water quality for the protection of beneficial uses of the waters of the state. Core regulatory programs of the SWRCB and Regional Boards are complemented and augmented by other state agencies.

The foundation of the state’s water quality protection program is the establishment of water quality control plans and policies to protect beneficial uses of waters. This program is discussed below in “Water Quality Standards.” Another program involves command-control regulatory activities such as permitting, monitoring and enforcement for point source discharges. For surface water discharges, command-controls are largely dictated by federal laws and the U.S. Environmental Protection Agency (U.S. EPA). This program, and types of situations covered, is discussed below in “Point Source Control Program.”

The Nonpoint Source Program involves the regulation of diffuse and diverse sources, referred to as “nonpoint sources,” not amenable to regulation by permit. The Nonpoint Source Program largely relies on best management practices (BMPs), monitoring and the threat and use of command-controls when voluntary actions fall short of preventing problems from occurring. This program, and types of situations covered, is discussed below in “Nonpoint Source Program.” These regulatory programs, coupled with environmental monitoring and assessment (covered in Chapter 6), provide the statewide framework for protecting beneficial uses of California’s waters.

As characterized in Regional Board basin plans, elements of watershed planning and management have been present for some time now in the state’s water quality

protection programs. However, full implementation of the watershed approach has not occurred statewide. As a consequence of a shift in the significant causes of water quality problems, from point sources to nonpoint sources, and a need to focus limited resources on priorities, the SWRCB and Regional Boards are in the process of re-invigorating watershed-based efforts. The SWRCB-Regional Boards' Watershed Management Initiative (WMI) embodies these renewed efforts.

Over the last 25 years, permitting programs have significantly reduced pollutants discharged to California's waters from point sources. However, the quality of many waters continues to be degraded from pollutants discharged from nonpoint sources. Future success in reducing pollutants from nonpoint sources and achieving additional cost-effective reductions in pollutants from point sources requires a shift to a more geographically-targeted approach.

The goal of the WMI is to integrate water quality monitoring, assessment, planning, standard development, permit writing, nonpoint source management, groundwater protection and other programs at the SWRCB and the Regional Boards. This will promote a more coordinated and efficient use of personnel and fiscal resources while ensuring maximum water quality protection benefits. Watershed work will be integrated and will support, to the extent possible, local community watershed protection efforts to implement cost-effective strategies for natural resource protection. As characteristics and resources vary widely from watershed to watershed, this approach customizes efforts to manage resources and address problems unique to each watershed, while offering stakeholders the opportunity to implement the most cost-effective solutions to problems within their watersheds.

Water Quality Standards

The SWRCB has adopted water quality control plans, such as the Ocean Plan and

the Thermal Plan, for the statewide application of controls. Water quality control plans have also been adopted by each Regional Board (i.e., basin plans). Basin plans designate the beneficial uses of each water body, establish water quality objectives to protect those beneficial uses, specify implementation measures and strategies, and outline monitoring and assessment measures. The designated beneficial uses and water quality objectives contained in water quality control plans are equivalent to the U.S. EPA's water quality standards. Water quality control plans meet the federal requirements for water quality management plans as specified in 40 CFR 130 and 131. These plans are reviewed triennially and amended as appropriate. As approved, these standards are considered protective.

The SWRCB has adopted policies for water quality protection, some of which are outlined below. Sections 13146 and 13247 of the California Water Code generally require that, in carrying out activities which affect water quality, all state agencies, departments, boards and offices must comply with all policies for water quality control and with applicable water quality control plans approved or adopted by the SWRCB. Essentially, SWRCB-approved water quality control plans and policies are state policy.

A description of the water quality control policies and plans that are of most applicability to protection and restoration of salmonid fisheries follows.

Regional Board Basin Plans

Regional Boards have adopted numeric water quality objectives for ammonia, temperature and dissolved oxygen, and narrative objectives for toxicity and sediment to protect the cold water, migratory and spawning habitats. Regional Boards have designated several beneficial uses of waters which are specific to the life stages of anadromous fish.

- *Marine Habitat:* Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish or wildlife (e.g., marine mammals, shorebirds).
- *Estuarine Habitat:* Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
- *Cold Fresh Water Habitat:* Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- *Migration of Aquatic Organisms:* Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.
- *Spawning, Reproduction and/or Early Development:* Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
- *Preservation of Rare and Endangered Species:* Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.

Total Maximum Daily Loadings (TMDL)

Section 303(d) of the CWA requires the state to identify waterbodies or segments of waterbodies not meeting water quality objectives due to a specific pollutant under current regulatory practices. While this section of the act deals with already impaired waters, its implementation provides

prevention and protection measures. The broad goals are the attainment of water quality objectives for the listed pollutants and protection and enhancement of beneficial uses. Specific goals include:

- Enhanced understanding of watershed and pollutant interactions.
- Analytical framework for determining compliance with water quality objectives.
- Enhanced watershed stewardship.
- Long-term monitoring.

See Chapter 5, "Restoration Programs," for a more complete discussion of the TMDL process.

Statewide Policies and Plans

Statement of Policy with Respect to Maintaining High Quality of Water in California, SWRCB Resolution No. 68-16, (1968): This policy generally restricts dischargers from reducing the water quality of surface water or groundwater even though such a reduction in water quality might still allow the protection of the beneficial uses associated with the water prior to the quality reduction unless it is demonstrated that the change will be consistent with maximum benefit to the people of the state, will not unreasonably affect existing and anticipated beneficial uses of the water and will not result in water quality less than prescribed. The goal of the policy is to maintain high quality waters. SWRCB Resolution No. 68-16 satisfies the federal antidegradation policy (40 CFR 131.12).

State Policy for Water Quality Control (1972): This policy declares the SWRCB's intent to protect water quality through the implementation of water resources management programs and serves as the general basis for subsequent water quality control policies.

Thermal Plan (1972, 1975): The Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries specifies water quality objectives, effluent

quality limits and discharge prohibitions related to thermal characteristics of interstate waters and waste discharges.

California Ocean Plan (1972, 1978, 1983, 1988, 1990, 1997): Similar to the Regional Boards' basin plans, the Ocean Plan designates the beneficial uses of marine habitat, fish migration, fish spawning, preservation and enhancement of areas of special biological significance and rare and endangered species, and establishes water quality objectives to protect those use.

Water Quality Control Policy for the Enclosed Bays and Estuaries of California, SWRCB Resolution No. 74-43, (1974): This policy provides water quality principles and guidelines for the prevention of water quality degradation in enclosed bays and estuaries. This policy does not apply to wastes from boats or land runoff except as specifically indicated for siltation and combined sewer flows.

Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling, SWRCB Resolution No. 75-58, (1975): This policy provides consistent principles and guidance for waste discharge requirements or other water quality control actions for thermal powerplants using inland waters for cooling.

Nonpoint Source Management Plan, SWRCB Resolution 88-123 (1988): Through Resolution 88-123, three general management approaches to address nonpoint source problems were identified. These are: (1) voluntary implementation of best management practices, (2) regulatory based encouragement of best management practices and (3) adopted effluent limits. In general, the least stringent option that successfully protects or restores water quality should be employed, with more stringent measures considered if timely improvements in beneficial use protection are not achieved.

Pollutant Policy Document (PPD), SWRCB Resolution No. 90-67(1990): The PPD establishes state policy for water quality

control to be used by the San Francisco Bay Regional Board and the Central Valley Regional Board in updating basin plans. The PPD requires the Central Valley Regional Board to develop a mass emission strategy for limiting loads of heavy metals, PAHs and selenium entering the Sacramento-San Joaquin Delta. It also requires that actions be taken to eliminate the discharge of chlorinated dibenzodioxins and dibenzofurans to the Delta, the control of antifouling compounds used on boats and the regulation of dredging.

Bay-Delta Plan (1995): The Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary includes objectives for flow, salinity, and export operations of the State Water Project (SWP) and Central Valley Project (CVP). The U.S. Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR) agreed to operate the CVP and SWP to achieve the objectives of the Bay-Delta Plan for a three year interim period. The water right permits of these two agencies were modified to remove inconsistencies between these permits and the Bay-Delta Plan. During the three year interim period, the SWRCB will hold a water right hearing to decide the water right obligations of the USBR, DWR and other water users in the Central Valley to meet the objectives of the Bay-Delta Plan. Adoption of a water right order implementing the Bay-Delta plan is scheduled for late 1998.

Rangeland Water Quality Control Plan, SWRCB Resolution 95-43 (1995): This plan represents a voluntary/cooperative approach to rangeland water quality management and corresponds to Tier One of the Nonpoint Source Management Plan. It also sets forth triggers that would move regulation of rangeland management into Tiers Two and/or Three. The plan addresses Coastal Zone Management Act requirements. No special emphasis on fisheries is spelled out; there is some emphasis on endangered species issues.

Authority

The Porter-Cologne Water Quality Control Act in the California Water Code provides authority to the SWRCB and Regional Boards, specifically Sections 13140, 13160, 13170, 13240 and 13242.

Implementation and Follow-up

For point source discharges, the SWRCB and Regional Boards adopt permits which incorporate all provisions of water quality control plans and policies (see the following section, "Point Source Program").

For nonpoint sources, the SWRCB and Regional Boards encourage the implementation of voluntary best management practices (pollution prevention measures) to achieve objectives. When voluntary measures fall short, permit programs and enforcement actions are considered (see section below, "Nonpoint Source Program").

U.S. EPA is in the process (late 1997 through early 1998) of promulgating the California Toxics Rule (CTR) which establishes water quality criteria for priority toxic pollutants for inland waters and enclosed bays and estuaries in California. In parallel, the SWRCB is preparing a statewide policy for implementing the criteria and statewide toxicity control provisions. The draft policy, released for public comment on Sept. 12, 1997, represents Phase 1 in a two-phase process to adopt new water quality control plans for inland surface waters (ISWP) and enclosed bays and estuaries (EBEP). Phase 2 will involve the establishment of state-adopted water quality objectives for the priority pollutants included in the CTR and the incorporation of the Phase 1 policy in an ISWP/EBEP. SWRCB will consider adoption of the draft policy after the U.S. EPA criteria become final.

For the California Ocean Plan, SWRCB staff is evaluating development of narrative and/or numeric biological water quality objectives based upon aquatic community structure, community function, diversity and population densities.

While Regional Boards believe that their standards and the permits that are adopted pursuant to those standards are protective of endangered and/or threatened aquatic species, some standards may not be explicit enough to satisfy NMFS with regard to the recent listing of coho and steelhead as threatened in parts of California. The North Coast Regional Board will be reviewing its standards and regulatory framework in the Russian River watershed for compliance with a "no take" provision under the federal ESA. Close coordination and consultation with the U.S. EPA and NMFS by the North Coast Regional Board in the review will point out those standards which may need revision or modification to satisfy NMFS as "no take" per federal ESA. Subsequent modification by the North Coast Regional Board would ensure that permits issued pursuant to those standards would constitute "no take." Other Regional Boards will be able to use the results of that review.

Point Source Program

Wastewater Discharges to Surface Waters

The National Pollutant Discharge Elimination System (NPDES) program regulates the discharge of pollutants from point sources to surface waters of the United States. The SWRCB and Regional Boards, as the implementing authority in California, perform the following primary functions: (1) issuing, revising and renewing NPDES permits and water reclamation requirements; (2) conducting compliance inspections to ensure adherence by the dischargers with their permit requirements; (3) investigating complaints of spills and leaks associated with permitted facilities; (4) reviewing discharger monitoring reports for accuracy, completeness and compliance with permit

requirements; (5) providing oversight of pretreatment programs (for publicly owned treatment works with such programs); and (6) pursuing enforcement actions for non-compliance with permit requirements. NPDES permit requirements are based upon objectives contained in water quality control plans and statewide plans and policies, as well as federal rules and guidance.

The goals of the program include:

- Achieve the water quality objectives set forth in the applicable Water Quality Control Plans.
- Assure the protection of the quality and beneficial uses of the state's waters through the development of NPDES permits containing waste discharge requirements, including effluent limitations and receiving water limits as appropriate.

Authority

The 1972 revisions of the Federal Water Pollution Control Act (FWPCA), known as the Clean Water Act (CWA), established the NPDES program. The CWA is implemented by Title 40 of the Federal Code of Regulations (40 CFR). The core of the NPDES program is covered in Parts 122 through 124. The U.S. EPA has approved the state of California's authority to implement the NPDES permit program in California. The Porter-Cologne Water Quality Control Act, California Water Code Section 13000 et seq, sets out California's implementation of the CWA.

Implementation and Follow-up

Regional Boards issue permits for discharges associated with activities such as sewage treatment, energy generation, mining, groundwater dewatering or toxic cleanup, storm water (see next section, "Storm Water Discharges") and a multitude of industrial and commercial activities. Staff conduct site inspections and review

discharger monitoring reports to verify compliance with NPDES permit limits. The Regional Boards also review reports of non-compliance with NPDES permit limits and issue enforcement actions for permit violations to bring the discharger back into compliance in a timely manner.

Specific Measures to Protect

Anadromous Fish and Habitat

NPDES permit limits regulate discharges from point sources to surface waters to ensure that such discharges meet applicable water quality standards and do not impair beneficial uses (including protection of cold fresh water habitat and preservation of rare, threatened and endangered species). NPDES permits contain numerical and narrative limitations (e.g., effluent limits for toxic pollutants; effluent and receiving water toxicity limits; water temperature, dissolved oxygen, pH and turbidity limits for receiving waters) for the protection of anadromous salmonids and their habitat.

Storm Water Discharges

The NPDES storm water permit program focuses on reducing pollutant loading into storm water systems to the maximum extent feasible. The program is implemented by issuing NPDES permits for storm water discharges from municipal separate storm sewer systems, storm water discharges associated with certain industrial activities and storm water discharges associated with construction activity which results in a land disturbance of five acres or more. Accordingly, the SWRCB issued a general construction storm water permit for construction activities that disturb five acres or more of land. This permit covers projects including commercial, industrial and residential land developments and road and highway construction. In 1997 the SWRCB reissued a general industrial storm water permit for storm water discharges associated with certain industrial activities. Additionally, Regional Boards have adopted municipal storm water permits for major urbanized areas, eight related permits for Department of Transportation (Caltrans) activities in the urbanized areas and

individual NPDES storm water permits for industrial activities.

Authority

The storm water NPDES permit program was enacted in 1987 under Section 402(p) of CWA. The core of the NPDES program is covered in Parts 122 through 124. The U.S. EPA has approved the state of California's authority to implement the NPDES permit program. The Porter-Cologne Act, California Water Code Section 13000 et seq sets out California's implementation of the CWA.

Implementation and Follow-up

Regional Boards are responsible for issuing permits for storm water discharges and follow-up. Staff conduct site inspections and review annual discharger reports to verify compliance with NPDES requirements. The Regional Boards also review reports of non-compliance with NPDES permit limits and issue enforcement actions for permit violations to bring the discharger back into compliance in a timely manner.

In the San Francisco Bay Area, all cities and counties are encouraged to develop and implement voluntary programs aimed at pollution prevention. Selected cities are required to develop "baseline" pollution prevention programs by virtue of the amount of pollutants being discharged from their storm drain systems. Pursuant to Water Code Section 13325 (c), over 25 local agencies, special districts and municipalities submit annual reports documenting their baseline programs.

Specific Measures to Protect

Anadromous Fish and Habitat

NPDES permit limits regulate discharges from point sources to surface waters to ensure that such discharges meet applicable water quality standards and do not impair beneficial uses (including protection of cold fresh water habitat and preservation of rare, threatened and endangered species). NPDES storm water permits achieve these through the implementation of BMPs in accordance with a site-specific storm water pollution prevention plan or area-wide storm water management plan. The storm water

pollution prevention plan or storm water management plan are flexible plans which should be undergoing a continuous improvement process. The purpose of these plans is to identify potential sources of storm water pollution, and identify and implement appropriate BMPs to prevent these sources from coming into contact with storm water runoff. Many of the BMPs are non-structural in nature, such as spill clean-up, sweeping and other good housekeeping procedures.

Discharges to Land and Groundwater

Discharges to land and groundwater are regulated by the SWRCB and Regional Boards in a manner similar (but not under federal purview) to that discussed above in "Wastewater Discharges to Surface Waters." Additionally, the California Department of Conservation (DOC) exercises authority over oil, gas and geothermal resources and the balance of this section focuses on DOC's activities.

DOC supervises the drilling, operation, maintenance and plugging and abandonment of wells throughout the state. DOC also supervises the operation, maintenance and removal or abandonment of other facilities, including tanks and pipelines, attendant to production and public safety and environmental hazards; to prevent damage to fresh water deposits, property and other natural resources; and to encourage the wise development of oil, gas and geothermal resources through sound engineering methods and practices.

Authority

DOC's authority over oil gas and geothermal resources is contained in Public Resources Code, Division 3 - Oil and Gas.

Implementation and Follow-up

Caltrans has applied for a statewide NPDES storm water permit to cover discharges of storm water from highways and highway related facilities. The permit will address design, maintenance and construction activities within Caltrans jurisdiction. It is

anticipated that Caltrans will be issued a permit in the spring of 1998.

Caltrans has developed a statewide Storm Water Management Plan in conjunction with an application for a statewide storm water permit. These documents define Caltrans regulatory obligations, commitments and statewide program for reducing the discharge of pollutants from the storm water drainage systems that serve Caltrans highways and highway-related properties, facilities and activities. To implement these programs, BMPs have been developed and are contained in three storm water quality handbooks: *Planning and Design Staff Guide*, *Construction Staff Guide*, and *Construction Contractors Guide and Specifications*. Training has been conducted throughout the state.

Caltrans is reviewing current operation and maintenance practices and developing a manual (*Maintenance Staff Guide*) to address the implementation of storm water BMPs during highway maintenance and activities conducted at maintenance facilities. A training program will be developed upon final distribution of this handbook. This training also will be made available to local road agencies.

DOC issues permits to conduct well operations and issues project approval letters for enhanced recovery and produced-water disposal injection operations. Enforcement activities include field surveillance and the issuance of deficiency letters, notices of violation, formal orders and civil penalty orders.

Specific Measures to Protect Anadromous Fish and Habitat

DOC maintains an active field presence in the oil, gas and geothermal producing regions of the state. Field engineers and technicians perform inspections and tests on wells, evaluate related facilities for regulatory compliance, and develop enforcement actions where necessary. Such activities provide for the protection of watersheds.

Instream Activities

The U.S. Corps of Engineers (Corps) issues federal permits to applicants for dredge or fill projects pursuant to Section 404 of the CWA. As part of this process, applicants must seek water quality certification from the state of California, in accordance with CWA Section 401. The types of activities that are regulated under this program include dredging, disposal of dredge materials, wetlands diking and filling, sand and gravel extraction, and stream alterations.

Throughout the state, the applicants apply to the Regional Boards for 401 certification.

The Regional Boards review and recommend action to the SWRCB executive director on the applications. The goal of this review process is to ensure that the proposed dredging/filling activity is consistent with beneficial use designations and water quality objectives that are established in each Regions' Basin Plan. The Corps cannot issue a permit if the state has denied water quality certification.

Hydroelectric power projects licensed by the Federal Energy Regulatory Commission (FERC) require 401 certification. As the construction and operation of hydroelectric projects involve water rights issues, the SWRCB provides FERC 401 water quality certifications.

Much of the aggregate mined in the state comes from instream mining. Many of these aggregate resources are identified and classified by the DOC under the Surface Mining and Reclamation Act for consideration in planning land-use alternatives. All mines must have a reclamation plan approved by the city or county in which the mine is located. The reclamation plan describes how a mine will be reclaimed so that adverse effects of mining are prevented or minimized. Regional Boards issue NPDES permits for sand and gravel operations conducted in waterways.

In April 1998, DOC's Policy Committee for Instream Mining submitted recommendations to the Governors Watershed Protection and Restoration Council regarding the existing regulatory framework governing instream

mining, the economic importance of aggregate resources obtained from instream mining, and possible programmatic approaches that might be applicable to regulating instream mining including a definition of “instream” for use in mineral resource evaluation and planning.

Authority

Section 401 Clean Water Act.
Section 404 Clean Water Act (Pilot Program San Francisco Bay Regional Board).
Surface Mining and Reclamation Act, Public Resources Code, Division 2, Chapter 9, Section 2710 et seq.

Historically, the types of issues dealt with by FERC are the same ones reviewed by the SWRCB when issuing water right permits for hydroelectric power projects. However, court decisions have limited the SWRCB’s water right review authority in hydroelectric-only facilities to the review of effects on downstream water right users. The courts have found that the SWRCB cannot exercise authority over fish and wildlife issues in FERC hydroelectric power projects because federal authority preempts state authority. However, the Federal Power Act provides that FERC must receive certification under CWA Section 401 that the project protects beneficial uses and can include terms to ensue that the beneficial uses of water are protected. FERC is required to include these terms into its license.

Implementation and Follow-up

Regional Boards evaluate dredging/filling applications for water quality impacts. Regional Boards may waive certification, recommend to the SWRCB executive director that certification be granted or denied, or adopt waste discharge requirements. Permit conditions, including mitigation requirements, may be established to lessen the impacts. The Regional Boards can take enforcement actions for permit violations.

Measures to protect fishery resources are developed on a case-by-case basis.

Typically, specific fishery studies have been performed for new projects. This is sometime the case for re-licensing activities. The environmental documents prepared under CEQA also help to identify measures needed to protect fish.

The SWRCB tracks and reports on Regional Board 401 certifications on a quarterly basis. SWRCB reports account for acreages of fill and mitigation requirements.

For mining, prior to conducting surface mining operations, a reclamation plan must be submitted to and approved by the lead agency. Each reclamation plan is also sent to DOC’s Office of Mine Reclamation for review of its conformance with the State Mining and Geology Board’s mine reclamation standards. The reclamation plan must describe how adverse environmental impacts will be prevented or minimized. The mine operator is required to maintain financial assurances such that the lead agency can reclaim the mine in the event that the operator cannot. Annual inspections by the lead agency are required to verify that the operator is in compliance with the approved reclamation plan. Administrative penalties of up to \$5,000 per day may be assessed for non-compliance.

Specific Measures to Protect

Anadromous Fish and Habitat

Each Regional Board has designated specific beneficial uses and corresponding water quality objectives in their water quality control plans to protect anadromous fish. These beneficial uses include marine habitat; fish migration and spawning; cold water habitat; rare, threatened and endangered species; and estuarine habitat. During the 401 certification process, the Regional Boards may deny or place restrictions on dredging permits based on potential impacts to the designated beneficial use.

Regional Boards have the authority to restrict dredging or dredge disposal activities during certain periods. The positive impact of this action for anadromous fish is a reduction in turbidity and sedimentation and a reduced potential for mobilization of

toxins during fish migration, spawning and rearing periods. For example, the San Francisco Bay Regional Board's Basin Plan specifies that disposal activities at the Carquinez Straits site may be restricted during spring and fall striped bass and salmon migrations. In addition, to prevent overfilling of the region's three aquatic disposal sites, the San Francisco Bay Regional Board adopted disposal volume targets in 1989.

Proposed instream and near-stream projects must receive 401 certification from the Regional Boards. These projects include maintenance dredging of stream channels, bridge repairs and stream restoration projects. Protection of anadromous fish resources is part of the agency review process. For example, consideration is given to minimizing erosion and removal of vegetation and to preserving natural channels.

In 1993, the governor issued Executive Order W-59-83, the California Wetlands Conservation Policy. The policy calls for "no overall net loss" of wetlands and achievement of a "long-term net gain in the quantity, quality, and permanence of wetlands acreage and values." Senate Concurrent Resolution No. 28 further states the intent of the Legislature to "... preserve, protect, restore and enhance California's wetlands..." Anadromous fish benefit from wetlands protection because wetlands reduce turbidity, filter out toxins and provide habitat for bait fish. Regional Boards implement this policy through the 401 certification process.

The issuance of a 401 certification is a discretionary action by the SWRCB and subject to the provisions of CEQA. The requirements for environmental review and the types of documentation required are similar to those in the water right application processing section above. Typically, new hydroelectric power projects require the preparation of an EIR. In some cases, re-licensing may also require extensive environmental documentation. However, the issues with re-licensing typically revolve around modifying facilities or facility

operations to protect instream beneficial uses better than the protection provided by current operations. Specific fishery studies are typically performed prior to the 401 process, and these studies are used to develop terms to protect fishery beneficial uses to the extent feasible.

Once the 401 certification is issued by the SWRCB executive director, the FERC includes the terms of the 401 certification into the FERC license. Follow-up actions are then under the jurisdiction of FERC.

Instream mining activities must be conducted such that all reasonable measures are taken to protect the habitat of fish and wildlife. Streambed channels and streambanks must be rehabilitated to a condition minimizing erosion and sedimentation. Settling ponds or basins must be constructed to prevent potential sedimentation of streams at mining operations where they provide a significant benefit to water quality.

In the San Francisco Bay Area, a cooperative approach called the "Long Term Management Strategy" (LTMS) for dredged material has been undertaken. The lead agencies include the Corps, U.S. EPA Region IX, San Francisco Bay Regional Board, San Francisco Bay Conservation and Development Commission, the SWRCB and the Central Valley Regional Board. The goals of LTMS are to conduct dredging and the beneficial reuse and disposal of dredged material in an environmentally and economically sound manner. The LTMS seeks to maximize reuse of dredge materials and to establish a cooperative framework for dredging permit applications. LTMS is working with the Central Valley Regional Board on the use of dredged material for levee restoration, wetland construction, shallow water habitat and shaded riverine habitat in the western portions of the Sacramento-San Joaquin River Delta.

The San Francisco Bay Regional Board and the Corps are in the process of developing a Section 404 pilot program. The Corps issued a public notice on August 12, 1997. The primary objective of the pilot program is to

investigate the most effective way to increase the state's role in efficient regulation of dredge and fill activities, while strengthening wetlands management and protection. If successful, the pilot program is expected to bring about the following changes in the 404 program:

- Improvement of enforcement, inspection and monitoring of Section 404 permit conditions.
- Facilitation and coordination of public and regulatory-resource agency interactions.
- Application of a watershed management approach to Section 404 permit review and enforcement activities.

The Central Valley Regional Board is in the process of developing general water discharge requirements to address various types of dredging activities and dredged material disposal and beneficial reuse alternatives.

Issues that remain to be addressed include landside and waterside sediment quality criteria or guidelines, level of protection for beneficial uses, point of compliance for BMPs, cost sharing and prioritizing beneficial reuse alternatives. The future of these activities is uncertain due to resource constraints.

Regional Boards are working with flood control agencies to lessen the impacts associated with stream maintenance dredging. Improvements are needed to reduce the mobilization of silts and removal of vegetation that occurs as a result of maintenance dredging.

Under the Bay Protection and Toxic Cleanup Program (BPTCP), the SWRCB and the Regional Boards are conducting detailed assessments of levels of pollutants in sediments. In the San Francisco Bay Area, the BPTCP is generating new data on "background" conditions that will enable regulators to better evaluate water quality impacts associated with dredging in the bay. The future of this program is uncertain, pending the governor's reauthorization.

Funding: Activities and concerns continue to increase and compete with other priorities for funding. For example, in water rights situations, between 1997 and 2015, 37 FERC-licensed projects will require re-licensing in California. Many of these are in the Central Valley and one is along the coast, possibly in a steelhead stream.

Nonpoint Source Program

In 1988, in response to the addition of Section 319 to the Clean Water Act, the SWRCB adopted the Nonpoint Source Management Plan. In 1995, to comply with Section 6217(c)(1) of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990, the state developed its Initiatives in Nonpoint Source Management, which serves as an update and expansion of the nonpoint source program.

The state's nonpoint source program relies on a three-tiered approach to control sources. This approach encourages voluntary controls and increases the level of regulatory oversight as appropriate in the three tiers which follow.

Tier 1, Voluntary implementation of BMPs: includes education, training, financial assistance, technical assistance and demonstration projects.

Tier 2, Regulatory-based encouragement: implemented if voluntary efforts fail to adequately protect water quality. Regional Boards may encourage BMPs by waiving adoption of waste discharge requirements on condition that dischargers comply with BMPs. The SWRCB and Regional Boards may enforce BMPs indirectly by entering into management agency agreements (MAAs) with other agencies. Regional Boards may also adopt BMPs into basin plans to facilitate their region-wide application.

Tier 3, Adoption and enforcement of waste discharge requirements

(permits): can be used to set limitations which require implementation of BMPs.

Several nonpoint source activities are highlighted in this section to illustrate the breadth of the program. These activities include confined animal facilities, livestock grazing, irrigated agriculture and forest activities.

Regional Board authority to protect water quality derives from federal and state statutes. The CWA is the principal federal water quality protection statute. It was amended in 1987 to include Section 319. Section 319 requires the states to develop assessment reports and management programs describing the state's nonpoint source problems and setting forth a program to address the problems. In addition, Congress passed Section 6217(c)(1) of the CZARA in 1990 to address coastal nonpoint source pollution. Under state law, the Porter-Cologne Act provides a comprehensive water quality control program for the state of California which applies to both surface and groundwater.

Confined Animal Facilities

The confined animal facilities program addresses operations where animals are kept in corrals, pens or housing. The size of the operations ranges from small stables with a few horses to feedlots with tens of thousands of animals. California is the nation's leading dairy state and a major producer of poultry, beef and hogs, so there are thousands of dischargers in this category.

All of the facilities generate and store animal wastes, and a large percentage of the operations dispose of the waste by applying it to land. They also produce wash water, bedding, litter and other waste materials that must be managed appropriately. The wastes can be acutely toxic to aquatic life and impact other beneficial uses of surface water. Salts and nitrogen in the waste can also significantly impair groundwater resources. In addition, erosion is a common problem associated with these facilities.

Most confined animal facilities are categorized as nonpoint sources of pollution, but some of the larger operations are classified as point sources under the federal NPDES program.

The California Department of Food and Agriculture (CDFA) oversees dairies, regulating animal health, water hygiene, well construction, feed storage, animal waste in corrals, corral slope and maintenance, as well as the health and safety components of the milk produced on the farm. While the overriding objective is to ensure that milk and milk products are safe and wholesome, CDFA activities complement water quality regulatory programs. CDFA performs inspections and certification of dairy farms and provides product grading services for the United States Food and Drug Administration (USFDA). Annual inspections are conducted of the 2,144 Grade 'A' dairy farms for market milk permits. CDFA also provide training and supervision for local Approved Milk Inspection Services (AMIS) to ensure statewide inspection uniformity. AIMS operates in the counties of Fresno, Imperial, Kern, Kings, Marin, Sacramento, San Joaquin, Sonoma, Stanislaus and Tulare.

Authority

Pursuant to the Porter-Cologne Act, the SWRCB has adopted regulations to address waste management at confined animal facilities (Sections 22560 through 22565 of Title 27 of the California Code of Regulations). The Regional Boards have also adopted water quality control plans that contain water quality objectives and an implementation program.

The state also implements most of the federal CWA requirements. The state's nonpoint source management program was prepared in part to meet federal requirements and addresses confined animal facilities along with several other pollutant sources. Many of the larger facilities also must comply with the federal NPDES permit regulations.

Under development is a program to implement the federal CZARA. This program will address management measures that must be followed at confined animal facilities to protect water quality.

CDFA operates under authorities specified in the California Food and Agricultural Code (Division 15 Milk and Milk Products Act of 1947) through the California Code of Regulations (Title 3, Division 2, Chapter 1, Articles 1 through 25) and as mandated by U.S. Department of Agriculture (USDA) recommended requirements for manufacturing milk purposes and the Grade 'A' Pasteurized Milk Ordinance; 1995 Edition.

Implementation and Follow-up

Regional Boards use different approaches to obtain compliance with Title 27 regulations and water quality control plans. For example, most dairies in southern California are regulated by waste discharge requirements but the Central Valley and North Coast Regional Boards have conditionally waived requirements for dairies that meet the regulations in an effort to obtain voluntary compliance. Statewide, the control effort has been focused on large commercial operations. Small facilities receive little attention except where local watershed efforts have addressed the cumulative impacts of runoff from these operations.

The SWRCB's Industrial Activities Storm Water General Permit and the permits issued by each Regional Board satisfy the requirements for the federal NPDES program.

Regardless of the approach used by Regional Boards, all regulatory and enforcement mechanisms in Porter-Cologne can be applied to confined animal facilities. These include adoption of waste discharge requirements and issuance of enforcement actions such as clean-up and abatement orders and administrative civil liabilities.

Specific Measures to Protect Anadromous Fish and Habitat

Both state and federal regulations prohibit the discharge control wastes from confined animal facilities to surface waters except during extreme storm conditions. The facilities must also be sited and constructed to prevent inundation and washout from either 20-year or 100-year peak stream flows, depending on the date of construction.

Livestock Grazing

There are approximately 40 million acres of rangeland in California, roughly half of which is on federal lands. The impacts on anadromous fisheries from rangeland management can include increased stream temperatures from reduced riparian vegetation, silting of the spawning beds from increased erosion, decreased dissolved oxygen and algal blooms from nutrient inputs, and contamination by fecal bacteria. The SWRCB and Regional Boards are responsible for assuring that grazing activities do not adversely impact beneficial uses of water, including uses by anadromous fish for spawning, rearing and migration.

Rangeland is handled differently, depending on ownership. USDA, U.S. Forest Service (USFS) and the U.S. Department of the Interior Bureau of Land Management (BLM) have authority and responsibility for most of the federal rangeland in California. Pursuant to the CWA, the SWRCB has certified a water quality management plan (WQMP) for national forest system lands in California (including BMPs for rangeland management), designated USFS as a water quality management agency for plan implementation, and executed an MAA with USFS. SWRCB and BLM have entered into a memorandum of understanding (MOU) to establish a WQMP/MAA for BLM-administered lands, including BMP implementation programs for rangeland management. Pursuant to federal legislation, both USFS and BLM are actively revising their standards and guidelines for rangeland health. This will result in the modification of existing USFS' BMPs. SWRCB is participating with BLM and USFS in the

development of these new standard and guidelines.

Private and public lands not administered by the federal government are addressed by the California Rangeland Water Quality Management Plan (CRWQMP) adopted by SWRCB as a Tier 1 (voluntary compliance) effort in accordance with the Nonpoint Source Management Plan. The emphasis is on education and outreach with help from the Natural Resources Conservation Service (NRCS), University of California Cooperative Extension, California Association of Resource Conservation Districts (CARCD), and California Cattlemen's Association. The BMPs set forth in the CRWQMP are derived from the NRCS Field Office Technical Guide.

Authority

The Porter-Cologne Act gives the SWRCB and Regional Boards authority to control water pollution from point and nonpoint sources. CZARA include mandates for the state to protect water quality from nonpoint source pollution. SWRCB has determined that CZARA is applicable statewide. Regional water quality control plans developed by Regional Boards and approved by SWRCB identify cold water and warm water fish species and the aquatic habitat that they use for spawning, rearing and migration as beneficial uses of water. Receiving water objectives that pertain to protection of anadromous fisheries from grazing activities include dissolved oxygen, temperature, sediment and turbidity.

As federal land management agencies, the BLM and USFS have authority to regulate range management practices on the lands they administer. New federal legislation mandates that BLM and USFS develop rangeland health standards and guidelines with a major emphasis on protection of riparian areas and water quality. USFS is implementing this mandate on a forest-by-forest basis, while BLM is doing so on a statewide basis.

Implementation and Follow-up

The SWRCB and Regional Boards are involved in BLM and USFS efforts to develop

and implement new standards, guidelines and BMPs for rangeland health. USFS and BLM are responsible for establishing appropriate terms and conditions on grazing leases and allotments and to ensure that these are appropriately implemented. USFS has an established effectiveness and implementation monitoring program for its existing rangeland BMPs.

NRCS, Cooperative Extension, CARCD, and the Cattlemen's Association encourage rangeland owners to develop and implement ranch plans or other appropriate documents memorializing their management goals and practices. NRCS and Cooperative Extension are providing training programs in this area. NRCS can condition assistance to private landowners on their implementation of the BMPs set forth in the CRWQMP.

Regional Board activities promote implementation of appropriate rangeland management BMPs and include:

- Participating in the implementation of the CRWQMP by encouraging and assisting ranchers to develop ranch plans that describe their ranch's natural resources, potential problems and positive contributions.
- Working with NRCS and Cooperative Extension on training and education programs for ranchers.
- Supporting local watershed programs that have rangeland management issues and help direct grants to watershed programs that implement livestock BMP projects.
- Conducting water quality surveys to assess water quality impacts from grazing.
- Reviewing grazing allotments on BLM and USFS administered public lands.
- Encouraging riparian fencing and off-channel watering troughs and rotation of animals on forage areas.
- Requiring ranch plans in watersheds listed under Section 303(d).

Specific Measures to Protect Anadromous Fish and Habitat

In compliance with CZARA, U.S. EPA issued *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. The guidance includes management measures for grazing which protect anadromous fish and their habitat. These measures include excluding livestock from sensitive areas, providing stream crossings and alternate drinking water sources, locating salt and additional shade away from sensitive areas, and using improved grazing management.

Irrigated Agriculture

Irrigated agriculture, as addressed in the Statewide Nonpoint Source Management Plan, contributes to nonpoint source pollution through:

- Drift from aerial application of agricultural chemicals.
- Storm runoff.
- Subsurface drainage.
- Irrigation tailwater (return flows).
- Leaching of agricultural chemicals to groundwater.

As now implemented, nonpoint source management of pollution associated with irrigated agriculture has focused on Tier 1, voluntary implementation of BMPs. Voluntary implementation has been encouraged through education, training, financial assistance, technical assistance and demonstration projects.

The voluntary approach takes advantage of the expertise and incentives offered by a variety of existing local, state and federal agencies, including NRCS, RCDs and Cooperative Extension. Funding, especially in the form of 319(h) grants, has allowed development and implementation of BMPs, education and training, and public outreach (see discussion of 319(h) grants in "Protection Assistance Programs"). For the most part, the issues associated with the control of pesticides are covered in "Protecting Fish from Pesticides."

Implementation and Follow-up

Implementation of the nonpoint source program involves outreach and education to

increase voluntary implementation of BMPs. Regional Board outreach efforts have included coordination with NRCS, RCDs, Cooperative Extension and others to encourage growers to implement BMPs. Regional Boards administer 319(h) grants for demonstration projects. Regional Board staff also help in developing courses, participate on technical advisory committees and review local grading ordinances.

Implementation of BMPs by growers has not been well quantified in the past. However, increased interaction and improved communication with local agencies through the watershed management effort may allow Regional Boards to better assess the rate and effectiveness of voluntary BMP implementation. Tier 2 (regulatory-based encouragement) and 3 (adoption and enforcement of waste discharge requirements) approaches have not been widely used in California, although other states have moved to a more regulatory approach to control nitrate contamination of groundwater associated with agriculture. Tier 2 approaches could be implemented by incorporation of BMPs into basin plans or through MAAs with local agencies. Tier 3, while perhaps necessary in some instances, would require substantial resources to implement. Application of Tier 3 has been limited due to the resources available for issuing waste discharge requirements to individual farmers and in monitoring and enforcement of the discharge. Application of Tier 3 was facilitated in one case in the Central Valley through consolidation of drainage discharges and development of a regional entity to take responsibility for the discharge. Consolidation of drainage discharges was made possible through agreements to use federal facilities for the conveyance.

The Toxic Substances Monitoring Program and State Mussel Watch Program are used to identify areas where bioaccumulation of pollutants causes problems. While runoff from agricultural lands, including pesticides, appears to be responsible for elevated

tissue levels in fish and other organisms, follow-up has been lacking.

Specific Measures to Protect

Anadromous Fish and Habitat

Specific measures to protect anadromous fish include all BMPs which reduce sediments and other pollutants in runoff from agricultural fields and in irrigation return water. The 1996 Farm Bill established the Environmental Quality Incentive Program (EQIP), which provides funding to address natural resource needs. The NRCS has leadership for the EQIP program and sets priority areas and funding criteria through local working groups, which include Regional Board staff. The State Technical Committee advises NRCS on EQIP funding priorities. On-farm conservation practices which are actively being encouraged by the NRCS include: planting vegetation on highly erodible areas; constructing water diversions on long slopes to reduce sheet and rill erosion; planting filter strips of vegetation to remove sediment, organic matter and other pollutants from runoff and wastewater; constructing grade stabilization of creek beds; constructing grassed waterways; constructing water and sediment detention basins; vegetating stream banks; and constructing underground outlets to collect and convey surface water. Regional Board staff also work with local agencies to improve grading ordinances, which may impact growers.

Regional Board staff receive proposals for EPA 319(h) and 205(j) grants, help proponents develop proposals, and rank proposals. These grant programs are discussed later in this chapter. Funded 319(h) projects are managed by Regional Board staff. Some 319(h) grants funded in recent years have addressed irrigation system evaluation, methods to reduce nonpoint source pollution from agricultural fields, analysis of impacts to wetland water quality from agricultural runoff, and improvements to water quality through restoration of wetlands (see "Protection Assistance Programs").

Cooperative Extension is promoting integrated pest management (IPM), which reduces reliance on pesticides. IPM can improve water quality by reducing the amount of pesticides applied to crops and hence carried into surface water. Techniques which incorporate the use of beneficial insects may require development of vegetated areas to serve as habitat for insects and result in protection for riparian areas. Coordination with IPM specialists and use of IPM BMPs can improve water quality protection, provide better habitat for fish, and promote species diversity. Some recently proposed 319(h) projects have incorporated IPM techniques.

Irrigation and fertilizer management measures can reduce the amount of irrigation water and the amount of nutrients applied to crops, thus reducing pollutants entering surface and groundwater and reducing the demand for water diversions. Some 319(h) grant funds have been used for education, to develop demonstration projects for irrigation and fertilizer management, and for BMP implementation.

Forest Activities

Most California waters that support anadromous salmonids have headwaters in forested watersheds. Silvicultural activities in these forested watersheds can lead to increased insolation; increased stream temperature and/or temperature fluctuation; loss of large woody debris (LWD) and instream structure needed for spawning and rearing habitat; imbedding of spawning gravel; filling of pools; decreased oxygen, nutrients and food organisms; and obstruction of fish migration.

Commercial timberland comprises 14.9 million acres in the state; most of it is located north of the Tehachapi Range. About 7.3 million acres of this commercial timberland are public lands managed primarily by USFS; BLM manages a small amount of commercial timberland. The 7.6 million acres of privately owned commercial timberland is about evenly divided between large industrial

owners and small non-industrial owners. Timber operations on nonfederal lands are regulated by the state Board of Forestry (BOF) and the California Department of Forestry and Fire Protection (CDF).

Pursuant to the Federal Clean Water Act, the SWRCB, Regional Boards, USFS, BOF and CDF use a management agency approach to control nonpoint source discharges from forest activities to help ensure that beneficial uses of water, including uses by anadromous fish for spawning, rearing and migration, are not adversely impacted. The goals of this approach include establishing complementary resource protection programs that will achieve the water quality standards set forth in applicable water quality control plans adopted or approved by the SWRCB and minimize unnecessary confusion, conflict, duplication and paperwork. The approach entails SWRCB certification of a WQM plan including BMPs for control of nonpoint source pollution, designation of one or more water quality management agencies for WQM plan implementation, and execution of a related MAA setting forth each management agency's responsibility to carry out its WQM plan.

In lieu of direct SWRCB/Regional Board regulation of the nonpoint source activities addressed by the WQM plan, the management agencies take the lead role in maintaining, protecting and restoring the quality and beneficial uses of water from the impacts of the activities they conduct, control or regulate and in monitoring the BMP and program implementation of effectiveness. SWRCB is responsible for overseeing the management agencies' implementation of the WQM plans and identifying any needed improvements in the BMPs or the manner in which they are implemented. This approach is fully in place on national forest system lands (with USFS as the management agency) and on nonfederal lands (with BOF and CDF as joint management agencies). The approach has recently been implemented with the state Department of Pesticide Regulation (DPR) which controls forest pesticide use on

nonfederal lands, and it is being developed with BLM.

Authority

All Agencies

- Federal ESA; NMFS and USFWS requirements
- Federal CZARA; U.S. EPA and National Oceanic and Atmospheric Administration (NOAA) requirements
- Federal Clean Water Act (CWA); U.S. EPA regulations
- Porter-Cologne Water Quality Control Acts; SWRCB policies
- Regional Board Water Quality Control Plans

All State Agencies

- CEQA
- California ESA

USFS

- Organic Administration Act, 1897
- Federal Land Use Policy Act
- Multiple-Use Sustained Yield Act, 1960
- Wilderness Act, 1963
- Forest and Range Renewable Resources Planning Act, 1974
- National Forest Management Act, 1976
- National Environmental Policy Act, 1969
- Executive Order 12088, October 13, 1978

BLM

- National Environmental Policy Act, 1969

BOF/CDF

- Z'Berg-Nejedly Forest Practice Act of 1973 (FPA); BOF Forest Practice Rules (Rules)
- Professional Forester's Licensing Act

Implementation and Follow-up

Implementation and follow-up are primarily the responsibility of the appropriate SWRCB-designated management agencies. Pursuant to the management agency approach, the SWRCB and Regional Boards carry out the following activities in

lieu of regulating silvicultural activities directly through their own authority:

- Review of proposed changes in agency regulations (e.g., the Rules) and implementation processes.
- Review of proposed federal and private land management plans (e.g., USFS forest land and resource management plans, sustained yield plans or non-industrial timberland management plans on nonfederal lands).
- Participation in federal and nonfederal watershed analyses.
- Review of proposed projects (e.g., federal timber sales, nonfederal timber harvesting plans), including, as appropriate, field inspections with the lead agency.
- Compliance inspections of ongoing or completed projects (usually with the lead agency).
- Enforcement actions (usually in support of, or at the request, of the lead agency, or when other remedies through the lead agency have been exhausted).
- Monitoring of BMP implementation and effectiveness (usually with the lead agency) and aerial herbicide applications.

In addition, Regional Boards or U.S. EPA may take the lead in developing TMDL requirements for water bodies that are listed pursuant to CWA Section 303(d) as threatened or impaired by silvicultural activities. Many of these watercourses are habitat for anadromous salmonids.

Specific Measures to Protect Anadromous Fish and Habitat

SWRCB/Regional Boards: SWRCB is responsible for implementation of the U.S. EPA/NOAA *Guidance Specifying Management Measures for Sources of Nonpoint Source Pollution in Coastal Waters* and has determined that the guidance will apply statewide. The guidance includes management measures for silviculture and related activities that serve to protect anadromous fish and their

habitat. U.S. EPA has found the USFS and BOF/CDF BMPs and implementation processes to be consistent with these management measures. The management measures for silviculture address pre-harvest planning, streamside management areas (SMAs), logging road construction and reconstruction, road management, timber harvesting and yarding, site preparation and forest regeneration, fire management, revegetation of disturbed areas, forest chemical management and wetlands forest.

The WQM plan for national forest system lands (USFS as management agency) contains about 100 BMPs; the WQM plan for nonfederal lands (BOF/CDF as management agencies) contains more than 250 BMPs. The USFS BMPs are more process and performance oriented; BOF/CDF BMPs are more prescriptive. These differences reflect the fact that USFS administers public lands and BOF/CDF regulates private lands. USFS measures to protect anadromous salmonids are contained primarily in two places: (1) the Aquatic Conservation Strategy (ACS) set forth in the Northwest Forest Plan, PACFISH, and the DRAFT CAL OWL EIS/Guidelines and (2) USFS Handbook 2509.22, Soil and Water Conservation Handbook which incorporates all of the SWRCB-certified BMPs. The BOF/CDF BMPs are set forth in the Rules.

CDF - Regulation of Private and State Timberlands: CDF's mission is to protect the people of California from fires, respond to emergencies, and protect and enhance forest, range and watershed values which provide social, economic and environmental benefits to rural and urban citizens. In addition to its direct responsibility for wildlands fire protection on over 32 million acres of California's privately-owned watershed lands, CDF also provides full fire service protection to an additional 11 million acres under agreements with other governmental entities at the local, state and federal levels. The mission also includes protecting resources through a vegetation management program, which uses prescribed fire and other means of vegetation management to reduce

hazardous fuel build-ups in areas at risk to wildfire, and through the regulation of timber harvesting on over 8 million acres of state and private lands.

Timber Harvest Regulation on State and Private Timberlands: The process of regulating timber harvesting on private and state-owned lands in California occurs under the Z'berg-Nejedly Forest Practice Act of 1973 (FPA) and CEQA. The nine member Board of Forestry adopts regulations under authority of the FPA and CDF administers those rules.

The FPA is intended to regulate timberlands to achieve two goals: to enhance, restore and maintain the productivity of timberland wherever feasible, and to achieve maximum sustained production of high quality timber while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment.

CEQA requires that public agencies do not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. The applicant must disclose and identify the significant effects of a project for state agency and public review.

Timber Harvesting Plan (THP) Review: Under the FPA, a THP must be prepared and signed by a registered professional forester and submitted to CDF for review and approval for each timber harvest. CDF foresters examine each THP and determine whether the plan may have a significant impact on the environment and is in compliance with the Forest Practice Act, CEQA and other state and federal laws. CDF submits the THP to an interdisciplinary review potentially involving the Regional Boards, DFG and the Division of Mines and Geology. Other agencies, such as the Department of Parks and Recreation, may participate when the harvest has the potential to affect resources for which they are responsible. CDF chairs the review team and has the final decision on the THP. The

other agencies may non-concur with the review team in writing and may appeal CDF's decision to the BOF.

A THP must include a description of the site to be harvested, the types of timber operations to be conducted and the mitigation measures to be used consistent with BOF's rules and other applicable laws. Information concerning silvicultural systems, yarding methods, reforestation methods, erosion control methods, stream protection, road building and erosion hazard potential and erosion control measures must be included in the THP. The forester must conduct a field investigation to apply the rules with respect to watercourse classification and protection measures, location of sensitive terrain and the development of appropriate mitigation measures or alternatives.

Each THP is subject to a pre-harvest inspection during the review process. All review team agencies are invited to attend. After the inspection, each attending agency can write a report and, if necessary, ask for mitigation for any activity that threatens to cause a significant effect on any forest resource or would violate any other state or federal law, such as the California ESA or the Porter-Cologne Act. The THP is also subject to public review. CDF considers all comments by the agencies and the public before making a decision on the plan. CDF rarely disapproves a THP. However, a vast majority of the THPs have mitigation applied before final approval.

Forest Practice Rules

The foundation for the regulation of forest practices in California is the forest practice rules. Due to the variety of individual circumstances of timber harvesting in California, the Rules are not strictly prescriptive. Flexibility is allowed to cover a wide variety of site specific circumstances. However, the underlying principle and goal is to achieve the timber harvesting objective without causing a significant adverse impact to any forest resource.

As an example of the flexibility in the Rules, CDF issued a directive on considerations that the private and public foresters should be giving to the coho salmon under the forest practice rules. The April 29, 1997, document titled "Coho Salmon Considerations (CSC) of Timber Harvests Under the California Forest Practice Rules" covers coho salmon biology, timber harvest impacts and possible conservation measures, and it encourages the RPF to seek input from knowledgeable fishery biologists when preparing plans.

The following table gives a sample of the Rules that provide protection to forest resources, including coho salmon. The table lists the five major resources that affect coho, what the rules provide as a minimum and what the THPs provide in actual practice. The actual practices are taken from the results of the on-going monitoring and auditing program of the department and board. The monitoring data is taken from sampling of a transect of more than 50 THPs out of a possible 1,000. These findings show what has resulted from a timber harvest and do not measure the effectiveness of the fish protection. Most THPs exceed the minimum requirements set forth in the Rules.

Table 1 A Sampling of California's Forest Practice Rules

RESOURCE	RULE MINIMUM	RULE AS APPLIED
Shade and Temperature	<p>Class I (fish bearing) retain <u>at least</u> 50% of the overstory and 50% of the understory canopy covering the ground and adjacent waters in a well distributed multi-storied stand.</p> <p>Class II (intermittent nonfish bearing stream within 1000' downstream) retain <u>at least</u> 50% of the total canopy covering the ground in a well distributed multi-storied plan.</p> <p>Class III (ephemeral) where needed to protect the beneficial uses of water as determined by professional judgment percentage leave canopy based on site- specific basis.</p> <p>Alternative or in lieu prescriptions may be developed by the RPF or director on site specific basis. Prescription must provide equal or greater protection for the quality and beneficial uses of water.</p>	<p>Long Term Monitoring Program (LTMP) and CDF audit programs show >70% overstory canopy remaining following harvest, on average*. (Measured with a spherical densiometer.) After CSC some landowners are leaving the watercourse and lake protection zone (WLPZ) uncut. Ranges from 25' to full WLPZ width.</p> <p>Same as above.</p> <p>* Note this number reflects correction for the quality assessment/quality control work done for the hillslope monitoring program.</p> <p>Audit program work has shown an average equipment exclusion for Class III watercourse of about 70 feet. Under CSC RPF's are designating 50' equipment limitation zones (ELZ) on most Class III.</p> <p>Alternative rarely used. In lieu is used more often. CDF does not approve if the in lieu does not provide equal or better protection than the standard rule.</p>
Large Woody Debris	<p>Retain <u>at least</u> two living conifers per acre at least 16" DBH and 50' tall within 50' of all Class I and II watercourses.</p> <p>Shade canopy retention standards for Class I and II waters.</p>	<p>Audit work surveys show an average of 29 trees over 16" within 50' of a Class I watercourse. After CSC some landowners are permanently designating specific large leave trees for LWD recruitment. Individual trees with high probability of falling instream in near future are marked for leave.</p> <p>Landowners encouraged to place LWD in watercourse with DFG concurrence. There high percentage of canopy retention on Class I and II watercourses means there will likely be many LWD recruitment trees left after harvest and any subsequent harvest.</p>
Sediment	<p>Watercourse and Lake Protection Zones for tractor logging:</p> <p>Class I: <30% slope 75'; 30-50% slope 100', 75%, slope 150'. Class II: <30% slope, 50'; 30-50% slope, 75'; 75% slope 100'. Class: determined on-site specific basis WLPZ operations and Protection:</p> <ul style="list-style-type: none"> Removal of trees to limit of shade canopy retention standards. No construction or reconstruction of roads, 	<p>Implementation of WLPZ widths met or exceeded Rule requirements for about 90% of hillslope monitoring transects, with minor departures from the rules about 10% of the time.</p> <p>Applied on site-specific basis.</p> <p>Canopy 70%+ being retained on Class I and II.</p> <p>LTMP found 100% compliance for Rule prohibiting road construction of tractor roads and landing in</p>

RESOURCE	RULE MINIMUM	RULE AS APPLIED
	<p>tractor roads, or landings when specifically approved by director.</p> <ul style="list-style-type: none"> Trees cut in WLPZ felled away from watercourse. Where less than 50% canopy exists prior to timber operations only sanitation-salvage may occur. At least 75% surface cover and undisturbed area shall be retained. No heavy equipment use in timber felling, yarding or site preparation unless specifically approved. Areas of mineral soil exceeding 800 sq. ft. exposed by timber operations treated for reduction of soil loss. Where necessary to protect the beneficial uses of water, any amount of area can be required to be seeded, mulched or replanted. Broadcast burning prohibited. <p>Road and Landing Construction:</p> <ul style="list-style-type: none"> Road construction on slopes over 65% requires full bench construction. Through fills constructed in 1' lifts. Drainage facilities required to pass 50 year storm event. Trash or debris racks required when necessary. Drain facilities shall not discharge fill or other erodible material. Energy dissipaters to be used. Drainage facilities in place by October 15 each year. No road construction under saturated soil conditions. Roads used for hauling in winter period shall be surfaced with rock in-depth and quantity sufficient to maintain a stable road surface. Permanent watercourse crossings shall be 	<p>WLPZ, except as specified in THP.</p> <p>For the rule requiring trees to be felled away from watercourses, LTMP found minor departures on about 3% of the WLPZ transects.</p> <p>Rarely are blowdown trees salvaged from the WLPZ through exemption process.</p> <p>LTMP WLPZ transects had an average of about 94% surface cover in zones.</p> <p>This rule was met or exceeded 99% of the time.</p> <p>Limited sample had 100% compliance with rules. Most THPs are designating areas as small as 100 sq. ft. will be treated. All crossings are being required to be treated.</p> <p>Limited sample had 100% compliance with rules.</p> <p>Some minor incursions have occurred.</p> <p>Limited sample showed that this rule was being met or exceeded 80% of the time.</p> <p>Being met.</p> <p>Limited sample showed that this rule is being met or exceeded about 90% of the time.</p> <p>LTMP road transects had an average of about 85% of transects meeting or exceeding this rule.</p> <p>Inspections show being met.</p> <p>After CSC under certain conditions no road construction allowed after October 15.</p> <p>Inspections show being met.</p> <p>Insufficient rocking of road wet areas were found about 17% of the time. Getting less plans with winter operations. Those plans that do have winter operations have enforceable standards on when to shutdown.</p> <p>LTMP showed about 70% of crossings evaluated met or exceeded the FPR preventing diversion potential at crossings.</p>

RESOURCE	RULE MINIMUM	RULE AS APPLIED
	<p>constructed or maintained to prevent diversion of stream overflow down the road.</p> <ul style="list-style-type: none"> All roads and tractor roads except those with permanent drainage facilities are waterbarred by October 15. During timber operations road running surfaces shall be treated for stabilization to prevent excessive loss of road surface materials. Drainage structures shall be maintained to allow free flow of water and minimize soil erosion. Maintain for erosion controls in roads, tractor roads and landing is at least 1 year and can be increased to 3 years. Cut, fill or sidecase slopes are to be treated to prevent discharging of materials into streams and lakes in quantities deleterious to quality or beneficial uses of water. <p>Tractor Operations:</p> <ul style="list-style-type: none"> No skidding through a watercourse with water present. Number of skid crossing kept to a minimum. Tractor roads limited in number and width necessary to remove logs. Heavy equipment shall not operate in unstable areas unless specifically approved. Tractor operations prohibited on slopes over 65%; slopes over 50% with a high or extreme erosion hazard rating; slopes over 50% which lead with flattening to sufficiently dissipate water flow and trip sediment. 	<p>Adequate numbers of drainage structures to minimize erosion on the roadbed were found to occur about 80% of the time.</p> <p>Inspections show being met.</p> <p>Hillslope Monitoring Program showed that 17% of road transects evaluated did not meet or exceed the FPRs requiring drainage ditches be maintained to allow free flow of water.</p> <p>One year is the norm, 2-3 years is required when necessary because of highly erodible conditions. Inspection done for enforcement.</p> <p>Inspections show being met.</p> <p>Being met.</p> <p>Being met.</p> <p>Hillslope Monitoring Program showed that tractor roads were limited in number and width to number needed on about 90% of skid trail transects observed.</p> <p>Hillslope Monitoring Program showed 100% compliance with the Rules dealing with unstable areas.</p> <p>Hillslope Monitoring Program showed 100% compliance with the Rules limiting tractor use on steep slopes.</p>
Flow	Stream crossing shall allow for unrestricted passage of fish and water.	Inspection show being done. Majority of time drafting from streams required to modify the rate of drafting or diversion to assure no visible drop in volume of water downstream.
Nutrients	Green slash is required to be removed from the stream if deposited by timber operations.	Inspection show being met majority of time.
Cumulative Impacts	Requires an assessment of on-site and off-site interactions of proposed project activities with the impacts of past and reasonably foreseeable future projects.	Each THP is evaluated on onsite specific basis. THP not approved if cumulative effect analysis inadequate.

Sustained Yield Plans: A sustained yield plan (SYP) addresses long-term sustained yield of timber resources, and a cumulative effects analysis which includes issues of fish, wildlife and watershed impacts on a large landscape basis. The SYP may be submitted at the option of the landowner and is intended to supplement the THP process. The SYP is similar to a program EIR or EIS. It covers a broad spectrum of issues on a landscape basis. Individual THPs must be submitted for individual harvest areas; however, the THP need not address issues already discussed and mitigated in the SYP.

Presently, CDF has received six SYPs for 709,000 acres. The department expects 20 more over the next three years. Several landowners are combining the SYP with a habitat conservation plan for listed species. The advantage to the landowner is the certainty and stability both documents bring to the management of their timberland. Timber, fish, wildlife and watershed issues all will be addressed on a landscape basis.

Program Timberland Environmental Impact Report (PTEIR): Timber operations on private land must comply with the California Environmental Quality Act (CEQA) which requires an Environmental Impact Report (EIR) for all projects. The process of review and approval of Time Harvesting Plans (THP) in accordance with the Forest Practice Act is judged to be functionally equivalent to an EIR. However, THPs have become so complex and detailed that they approach the characteristics of an EIR. In 1996, the Board of Forestry adopted PTEIR rules which allow individual landowners to prepare an EIR that covers timber harvesting for their entire ownership. The PTEIR goes through normal CEQA review with the California Department of Forestry and Fire Protection (CDF) serving as Lead Agency. After approval of the PTEIR, individual program timber harvesting plans (PTHP) can be prepared and submitted for approval to CDF without having to go through the functional equivalent process or the necessity of an EIR. The PTHPs are significantly shorter and less complex than a normal THP. The

required CEQA public notice and review is conducted once under the PTEIR and does not have to be repeated for each PTHP. All operational forest practice rules are the same as required for THPs. The PTEIR is a long-term comprehensive forest planning document that provides social, economic, and environmental benefits. It can be complex and expensive to prepare but the cost is offset by the reduced cost and review time for individual PTHPs.

Exemptions from THP Requirements: Certain minor timber harvesting operations are exempted from the preparation and review of a THP. These operations still are subject to the operational portions of the rules and must meet 10 additional requirements to be considered as not having a significant adverse impact on forest resources. The exemptions are for Christmas tree cutting; harvesting dead, dying and diseased trees and fuelwood in amounts less than 10 percent of the average volume per acre; fire safe harvests of trees within 150 feet of a dwelling; and a one-time conversion of three acres to some other use than the growing and harvesting of timber. The 10 additional conditions include:

- 1) No tractor operations on slopes over 50 percent.
- 2) No new construction of tractor roads on slopes over 40 percent.
- 3) No tractor operations on known slides and unstable areas.
- 4) No new road construction or reconstruction.
- 5) No heavy equipment operation in watercourse and lake protection zone (WLPZ), except for maintenance of roads and drainage facilities.
- 6) No known sites of rare, threatened or endangered plants or animals will be disturbed, threatened or damaged.

- 7) No timber harvesting in a WLPZ except for sanitation-salvage harvesting.
- 8) No timber operations in a buffer zone of a species of special concern.
- 9) Operations in a special treatment area will conform to special rules of the special treatment area.
- 10) No timber operations on any significant archaeological or historical site.

Under certain emergency conditions, timber operations may begin without an approved THP. However, a notice of emergency operations is required. This notice is submitted by an RPF with a declaration, under penalty of perjury, that a bona fide emergency does exist and that immediate harvesting of trees is warranted. Timber operations may begin five days after the department receives the notice and may not extend more than 120 days unless a THP is submitted to and approved by CDF.

Emergency timber operations must comply with all operational forest practice rules. The department places a high priority on field inspections of emergency operations because, unlike the exemption harvesting, emergency harvesting can be a full-blown timber operation with potential for environmental damage. The following types of conditions constitute emergencies:

- 1) Dead, dying trees as a result of insects, disease, parasites or animal damage.
- 2) Fallen, damaged, dead or dying trees as a result of wind, snow, freezing weather, fire, flood, landslide, earthquake or air and water pollution.
- 3) Cutting or removing trees required for the emergency repair of roads.
- 4) Potential financial loss of timber that was previously inoperable or unmerchantable because of access, location, condition or timber volume, if the harvest of this timber has become unexpectedly feasible, and the opportunity to harvest will not be economically feasible for more than 60 days, provided that the

operations will have only minimal impact on timber resources.

Enforcement of the Forest Practice

Regulations: After the THP has been approved, CDF makes periodic compliance inspections of the harvesting operations. The operation must not only comply with the Rules, but also any special provisions in the THP. The timber operations are done by a licensed timber operator. The operator's license may be suspended, revoked or denied for Rules violations. Rules violations are misdemeanors and punishable by a fine of not more than \$1,000 or by imprisonment in the county jail for not more than six months. CDF has authority through the FPA to issue stop work orders, file Notices to Take Corrective Action and issue liens on property if corrective action has to be done by the state. RPFs may also be censured through the Professional Foresters Licensing Committee of the BOF.

CDF conducts an average of 8,400 inspections of timber operations yearly. On the average, notices of violation are issued on 11 percent of the operations. Approximately 125 misdemeanor cases are taken to the district attorney for prosecution.

U.S. Forest Service

USFS has a range of existing programs designed to maintain water flow and water quality, and restore and maintain the health and diversity of aquatic ecosystems. This includes, but is not limited to, programs in water quality protection, watershed restoration, riparian restoration, fish habitat management and restoration, road maintenance and decommissioning, and mine reclamation. Many other USFS programs and activities rely on successful stewardship of water and aquatic ecosystems. USFS has implemented several landscape level management plans for aquatic ecosystems in the last five years, including the ACS and the region-wide *Sustaining Ecosystems: A Conceptual Framework*. These strategies need continued support and refinement.

The USFS' BMPs and prescriptions related to planning and projects and to the evaluation of potential impacts on the quality and beneficial uses of water are implemented at each of the three major levels of USFS planning: forest plans, project plans, and leases and contracts. BMPs and prescriptions incorporated into higher-level plans are carried forward into subsequent subordinate plans or contracts. Planning is conducted with input from staff foresters, hydrologists, geologists, and other professionals, and it is subject to NEPA requirements for environmental review, documentation and mitigation.

In addition to the administering officer, USFS staff foresters, hydrologists, geologists and other professionals participate in compliance inspections of USFS projects to ensure that they are implemented as specified in the controlling lease or contract and to monitor the effectiveness of the management measures and specified practices. On federal lands, enforcement is carried out through lease or contract provisions.

Monitoring Forest Practices on State and Private Timberlands

The Monitoring Study Group was formed by BOF in 1989 to develop a long term monitoring program (LTMP) for assessing the effectiveness of the forest practice rules in protecting water quality. The group is made up of members of the public, resource agencies and the timber industry. Several projects have been carried out over the past five years by this program. The primary objective of the LTMP is to provide an ongoing assessment of the effectiveness of the forest practice rules, as implemented, in protecting the most sensitive beneficial uses of water (i.e., cold water fisheries and domestic water supplies) through implementation, effectiveness and project monitoring.

The LTMP results will be provided to the BOF and the public in a timely manner to contribute effectively to BOF's program for reviewing and, where necessary,

strengthening the rules' performance as BMPs.

The LTMP has an instream and hillslope component. The first year of data collection on the hillslope component was completed in 1996 on 50 timber harvesting plans. The data collection continues on another 50 THPs in 1997. A summary of the 1996 data should be available later this year.

In addition to the hillslope monitoring efforts, DFG has produced the *Instream Monitoring Handbook*, describing in detail how to develop and implement an instream monitoring program. In addition, CDF is working with the North Coast Regional Water Quality Board and the Mendocino County RCD to develop an instream monitoring plan for the Garcia River Watershed. CDF has approximately \$250,000 yearly for monitoring projects.

USFS has carried out a Best Management Practices Evaluation Program (BMPEP) for five years. Enough data has been generated by many BMPs to allow statistically valid inferences to be made. Under Regional Office direction and training, each national forest carries out a BMPEP program. The Regional Office is finalizing an instream monitoring program. A summary of the 1996 BMPEP results is available. The BMPEP results are used to determine needed or desirable changes in the BMPs and/or in the way they are implemented.

Monitoring Program for Forest Operations

The BOF has supported a monitoring study group since 1989. Under the hillslope monitoring portion of this study group, and under contract with CDF, the DOC prepared a digital map product in 1994 entitled "Erosion Potential in Private Forested Watersheds: A GIS Model." In addition, DOC prepared more detailed geologic and slope stability maps for three watersheds - the Gualala River, the Mokelumne River and Caspar Creek - which were released in 1995. DFG has also conducted instream field studies sponsored by this group and under contract to the CDF. These studies

tested monitoring techniques and made recommendations for future programs. The final CDF-DFG-Regional Board report is released and lays the ground work for cooperative monitoring between agencies and landowners. This work will continue with cooperative agreements and contracts for in-channel and hillslope field monitoring.

Protecting Fish from Pesticides

Department of Pesticide Regulation Programs

The Food and Agricultural Code (FAC) authorizes DPR to register pesticides for sale and use in the state. The FAC also authorizes DPR and the county agricultural commissioners (CACs) to regulate the sale, storage, handling and use of pesticides, and states that one of the purposes of the pesticide regulatory program is to protect the environment from environmentally harmful pesticides.

Pesticides are substances intended to be used for preventing or controlling pest problems, defoliating plants, and regulating plant growth. They are used in a variety of ways that benefit society. Agricultural production, public health and safety programs, structural pest control, ornamental landscapes and exotic pest control programs all rely to some degree on the availability and use of pesticides. However, pesticides can also have detrimental effects, including off-site movement to surface water at concentrations that can adversely affect aquatic organisms and human health. Responsible pesticide use maximizes the benefits of use while minimizing the adverse effects that pesticides can cause.

DPR is the lead agency, with local administration by CACs, for pesticide regulation in California. DPR has the authority and responsibility to:

- Provide for the proper, safe and efficient use of pesticides that are essential for protecting the public health and safety in the production of food, fiber, forest products, ornamental horticulture, and for other uses that include structure, home and landscape maintenance.
- Protect the environment from harmful pesticides by prohibiting, regulating and controlling uses of such pesticides.
- Assure the agricultural and pest control workers safe working conditions when pesticides are present.
- Permit pest control by competent and responsible licensees, certificate holders, permittees, and operator identification holders under strict control of the DPR director and CACs.
- Ensure that pesticides are properly labeled and appropriate for the use designated by the label.
- Encourage the development and implementation of pest management systems, stressing application of biological and cultural pest control techniques with selective pesticides, when necessary, to achieve acceptable levels of control with the least possible harm to nontarget organisms and the environment.
- Continuously evaluate pesticides to determine if any endanger the agricultural or nonagricultural environment, placing appropriate restrictions on use, including limitations on worker reentry, quantity used, area treated and manner of application.
- Establish, as necessary, criteria to evaluate environmental effects of pesticides.
- Coordinate with other local, state and federal agencies responsible for environmental issues regarding pesticides and water quality.

Groundwater Protection Program

The purpose of the Pesticide Contamination Prevention Act (PCPA) is to prevent further pesticide pollution of groundwater from legal agricultural use of currently registered pesticides. Pollution as used in the PCPA (Section 13142[j]) means introducing into the groundwater an active ingredient, other specified product, or degradation product of an active ingredient of an economic poison above a level, with an adequate margin of safety, that does not cause adverse health effects. This PCPA has been incorporated into DPR's overall groundwater protection program and provides a mechanism for identifying and tracking pesticides with the potential to pollute groundwater.

As part of its pollution prevention program, DPR conducts an annual statewide educational program. This program promotes reduced-risk practices in areas designated as sensitive to groundwater due to agricultural use or by using the method described below. The designation of areas is based either on pesticide detection in groundwater due to agricultural use or on the physical, chemical and use characteristics of a specific pesticide.

DPR evaluates the effect of climate, soil type, product formulation, method and rate of application of pesticides; timing and method of irrigation; seasonal timing of application of pesticides; and other factors affecting the movement of the pesticides to groundwater. From this evaluation, DPR develops reduced-risk practices to minimize movement of pesticides to groundwater. To identify areas sensitive to groundwater pollution by pesticides, DPR uses a model based on the above listed criteria.

Authority

In 1985 California enacted the PCPA (Division 7, Chapter 2, Article 15, FAC) which gives DPR the authority for this groundwater protection program.

Implementation and Follow-up

At a local level, the CACs enforce the PCPA by issuing pesticide use permits, training

applicators, application inspections, and compiling pesticide use reports.

Specific Measures to Protect

Anadromous Fish and Habitat

Many of the areas of concern for groundwater are closely connected to surface water. Protecting groundwater also provides protection for surface water source and fisheries.

Rice Pesticide Program

Programs to reduce discharges of molinate and thiobencarb to surface waterways began in 1984. Strict water management requirements were imposed on rice growers who use molinate and thiobencarb, thus allowing the herbicides to dissipate prior to release to surface waterways. Discharges of molinate into the Sacramento River were reduced by more than 99 percent by 1992, and fish kills from molinate have not recurred since 1983. Thiobencarb discharges were reduced by more than 97 percent between 1985 and 1990, which resulted in the protection of the aesthetic qualities of drinking water. No thiobencarb has been detected in the Sacramento River since 1990. The programs to reduce the presence of rice insecticides in state waterways that began in 1991 are based on water management strategies. Each of these pesticides is monitored in Sacramento Valley waterways.

Implementation and Follow-up

DPR continues to oversee rice pesticides monitoring in surface waters. Fish kills, once involving tens of thousands of fish annually, have been eliminated, and the taste problem that plagued Sacramento's drinking water has also ceased. Each year, scientists and regulators evaluate the previous year's results and work together with industry to refine and improve the next year's program.

Specific Measures to Protect

Anadromous Fish and Habitat

The effectiveness of specific management practices which prevented the movement of

the pesticide residue in river systems has been established and documented.

Pesticide Management Plan for Water Quality

The California Pesticide Management Plan for Water Quality is a joint effort by DPR and the SWRCB to protect water quality from the potential adverse effects of pesticides. It describes how DPR and the CACs will work in cooperation with the SWRCB and the Regional Boards to protect water quality from the use of pesticides. The plan is part of an effort to make regulatory programs addressing pesticides and water quality more understandable, consistent and efficient.

The plan contains provisions for outreach programs, compliance with water quality standards, groundwater and surface water protection programs, self-regulatory and regulatory compliance, interagency communication, and dispute and conflict resolution. The appendices contain a copy of the Management Agency Agreement (MAA) between DPR and the SWRCB, a list of reduced-risk practices for minimizing the potential for off-site pesticide movement and transport of residues to groundwater or surface water, information on procedures to protect proprietary information, and applicable state and federal laws and regulations. The plan recognizes both the importance of water quality in the state and the role pesticides play in maintaining a strong economy and protecting public health and safety.

Authority

An MAA between the SWRCB and DPR was signed by both agencies and concurred by the California Environmental Protection Agency in March 1997.

Implementation and Follow-up

Ongoing reviews of the program occur with interaction between agencies.

Specific Measures to Protect

Anadromous Fish and Habitat

The Pesticide Management Plan establishes an ongoing, organized means of interagency response to issues of concern. Efforts can be directed to watersheds of concern for anadromous fish as needed.

Endangered Species Program

DPR has studied ways to protect federally listed species from potentially harmful exposure to pesticides with funding by U.S. EPA since 1989. DPR's efforts have complemented the U.S. EPA Endangered Species Protection Program and refined its application to California in part by providing more specific local information on the proximity of pesticide use to habitats of listed species. The *Index to Pesticides that are Used in Proximity to Federally Listed, Proposed and Candidate Species in California by Species*, by Richard A. Marovich and Steven Kishaba is available from DPR. This document lists by species the pesticides used within a section (1square mile) of that species' habitat.

DPR's resource base of information on pesticide exposure to many species of concern include:

- Comprehensive library on the toxicology of pesticides to aquatic organisms.
- Records of all agricultural uses of pesticides (the Pesticide Use Database) by active ingredient, rate of application, site (commodity), date applied and geographical location (township, range and section).
- Pesticide use permit system provides advance notice of applications of pesticides that pose particular risk to nontarget organisms.
- Internet site that provides information on protection of listed species.
- Agreements with DFG to investigate fish or wildlife losses when pesticides are suspected.
- A statutory partnership with county agricultural commissioners to enforce pesticide use violations

(emphasizing compliance with labeling).

- Development of pesticide use limitations and applicator training materials for protection of listed species in cooperation with DFG, the USFWS, U.S. EPA, CACs and other interested organizations and individuals.

Implementation and Follow-up

Bulletins for each county are currently in draft form. These bulletins will identify for each county by species the specific insecticides used in that county, providing this information in a useable format at a local level.

Specific Measures to Protect

Anadromous Fish and Habitat

The Endangered Species Program provides tools at the local level to evaluate the use of specific pesticides of concern. The Endangered Species Program is being evaluated on a continuous basis and adjustments made as needed.

Dormant Spray Water Quality Program

Winter surveys conducted by DPR, the Regional Boards and USGS frequently found dormant spray residues in the San Joaquin River watershed. Some dormant spray levels were high enough to cause aquatic toxicity. Any substance found to cause toxicity violates water quality standards. Consequently, DPR established the Dormant Spray Water Quality Program.

Through the Dormant Spray Water Quality Program, DPR seeks to prevent aquatic toxicity from organophosphate pesticide residues (diazinon, chlorpyrifos and methidathion) in the Sacramento and San Joaquin rivers. The initial effort focuses on promoting voluntary efforts to prevent aquatic toxicity. Concurrently, monitoring data gathered by DPR will verify compliance with water quality standards.

Authority

The Dormant Spray Water Quality Program is currently a voluntary program monitored and reviewed by DPR. It may, if necessary, become a regulated program.

Implementation and Follow-up

The Dormant Spray Water Quality Program is implemented at the local level through a cooperative effort of the CACs, Regional Boards, growers, Cooperative Extension, farm bureaus, other interested parties and the general public. Adjustments to mixing and loading practices, application techniques, orchard floor management, and other integrated pest management practices are used to reduce the impact of dormant sprays.

Specific Measures to Protect

Anadromous Fish and Habitat

As watersheds are evaluated statewide in respect to the protection of anadromous fish, the Dormant Spray Water Quality Program is an established means of response by DPR to the pesticide issues identified.

Caltrans Integrated Pest Management Program (IPM)

Caltrans controls vegetation on the roadsides to maintain roadbed integrity, visibility, drainage, noxious weed control, aesthetic roadside appearance and fire protection. Caltrans uses a variety of integrated pest management methods including: chemical (herbicides), mechanical (mowing), cultural (organic mulch), manual (pulling) and biological (insects and other biological agents).

Starting in 1987, Caltrans has subjected its vegetation control program to intense analysis. Since then it has prepared an environmental impact report including a detailed risk assessment of all chemicals it uses, has adopted a generalized policy statement which focuses on reducing chemicals for vegetation control, and has completed a four-year study of roadside maintenance activities which is contained in

the document "California Roadsides: A New Perspective."

Caltrans is responsible for the safety of users on the state highway system which requires careful management of vegetation. The safety consideration is paramount for all policy decisions. However, it is often possible to maintain reasonable safety levels while adopting non-chemical control methods through cost-effective integrated vegetation management concepts (IPM program). IPM can be considered to be the assembling of reasonable vegetation control tools and employing the proper tool at the right time to achieve objectives of cost and safety.

Caltrans does only that vegetation control which is necessary for safety, aesthetics and fire risk management. It still relies heavily on chemical control methods because of the effectiveness of this method and its low cost. Chemicals used are only general-use products and are applied strictly in accordance with label requirements. Generally, only a thin band adjacent to paved shoulders from 6 feet to 8 feet wide is treated. Live water courses and standing water are avoided. Label requirements for avoiding water are followed.

Caltrans' long range plans are to reduce chemical use as changes can be made in the design and construction of future facilities to reduce the need for vegetation control and where alternative species of vegetation can be established which do not require intensive control.

Protecting Fish from Introduced Species

Pest Exclusion Program

CDFA's Pest Exclusion Program prevents the introduction and spread of injurious animal and plant pests by preventing the entry and establishment of exotic pests and limiting the

intrastate movement of newly-discovered pests.

A cooperative working relationship exists among federal, state and county governments working in separate, complementary or shared areas of responsibility. Generally, the federal government (USDA) focuses on foreign pests and monitors international points of entry. CDFA and the CAC are involved in interstate and intrastate exclusion activities and issues.

California's pest exclusion network currently enforces federal, state and county level quarantines. To accomplish this, the Pest Exclusion Program monitors all avenues of entry into the state. Along highways entering California, federal and state inspection stations monitor and inspect incoming foreign and domestic passenger and commercial vehicle traffic. At air and maritime ports, federal, state and county agricultural officials inspect arriving aircraft, vessels, luggage and cargo. Additionally, all mail and parcel carriers, truck and rail terminals, feed mills, nurseries and military carriers are monitored by exclusion personnel to ensure that exotic pests are kept from entering the state.

Specific Measures to Protect

Anadromous Fish and Habitat

Domestic plant quarantine regulations which particularly serve to protect anadromous fish and their habitat include: Federal and State Noxious Weed Regulations; Gypsy Moth, Pine Shoot Beetle, Asian Longhorned Beetle, Imported Fire Ant and European Larch Canker Federal Domestic Quarantines; Chestnut Bark and Oak Wilt Diseases, Nut Tree Pests, Walnut and Pecan Pests, Cedar-Apple Rust and European Pine Shoot Moth State Exterior Quarantines; and the Hydrilla Exterior and Interior Quarantines.

Hydrilla and Alligatorweed

CDFA prevents the harm exotic invasive pests can cause to agriculture and the natural environment. As part of the overall pest prevention strategy, CDFA biologists

conduct detection and eradication activities to find and eliminate invasive exotic aquatic weeds such as hydrilla (*Hydrilla verticillata* Royle) and alligatorweed (*Alternanthera philoxeroides*).

Hydrilla and alligatorweed eradication programs prevent the destructive environmental impact that would occur to the state's aquatic resources (lakes, reservoirs, streams and rivers) if these invasive pests were allowed to become established and distributed in California. Once hydrilla or alligatorweed become established in an aquatic ecosystem, such as the rivers and streams that provide vital habitat for anadromous fish, they out-compete native vegetation, eliminate biological diversity and disrupt the ecological integrity of the resource. Hydrilla and alligatorweed produce dense infestations within the water column which eventually results in a canopy above the water service. Once this occurs, a number of biological, physical and chemical processes necessary for maintaining a productive habitat are restricted or eliminated. For example, hydrilla or alligatorweed would impact anadromous fish habitat by restricting flows and increasing sedimentation building, reducing future flow capacity. Dense growth would prevent light penetration into water, altering water quality by impacting the photosynthetic respiratory equilibrium of phyto and zooplankton. In addition, the loss of spawning areas due to formation of dense weed beds would severely impact the spawning capacity of many streams and rivers.

Authority

California Food and Agricultural Code (FAC) Section 403 requires the CDFA to prevent the introduction and spread of injurious insect or animal pests, plant diseases and noxious weeds in the state. FAC (Section 461) states that CDFA may conduct surveys within the state for the purpose of detecting the presence of a pest or disease. Section 482 allows the secretary of CDFA to enter into cooperative agreements for the purpose of eradicating, controlling or destroying any infectious disease or pest within the state.

Section 6048 requires CDFA to conduct an ongoing survey and detection program for hydrilla. Whenever and wherever hydrilla is discovered, the secretary shall immediately investigate the feasibility of eradication. If eradication is feasible, the department shall perform the eradication in cooperation with federal, city, county or other state agencies, taking those steps and actions the department deems necessary.

Implementation and Follow-up

The programs to eradicate hydrilla and alligatorweed use an integrated approach for the eradication of these aquatic pests. Depending on the situation, combinations of chemical, mechanical, biological and cultural methods are implemented at each infested site to remove current established plants and prevent further growth and reproduction by eliminating reproductive propagules. The programs utilize biologists, agricultural pest control specialists and seasonal employees to conduct detection and eradication activities. In addition to eradication efforts, program staff provide training to federal and state cooperating agencies and to CACs who provide local regulatory and administrative support to the program.

Fund support for these programs are provided by the state General Fund, and monies or in-kind services are provided by county departments of agriculture, other state agencies such as, the departments of Fish and Game, Water Resources, and Boating and Waterways, and federal agencies such as the Army Corps of Engineers, USBR and USDA.

Once a hydrilla or alligatorweed eradication project area has been established, internal quarantine regulations are established to prevent the movement of the pest to noninfested areas or bodies of water. These regulations are maintained throughout the duration of the project. At the present time, eradication of hydrilla from various aquatic sites in 10 California counties and the limited distribution of hydrilla and alligatorweed in California indicates success.

Exotic Pest Trapping and Eradication Program

The goal of the program is to detect and eradicate harmful exotic insect pests before economic or environmental damage can occur. Target pests are gypsy moth, Japanese beetle and various species of fruit flies, including Mediterranean, Oriental, Mexican and melon fruit flies. The program places and monitors over 102,000 insect traps throughout California. The program is a joint effort of CDFA, the local CAC and USDA.

Authority

Authority is set forth in Section 3591.2 of Title 3 of the California Code of Regulations, Sections 401, 403, 5000 et seq., and 75761-5763 of the Food and Agricultural Code.

Implementation and Follow-up

CDFA contracts with the county Agricultural Commissioner to implement the program at the local level. The program operates year around in southern California and seasonally in northern California. CDFA and USDA perform annual independent quality control inspections in each county. Program success is measured by the detection and eradication of any exotic pests in California before they become established.

Specific Measures to Protect

Anadromous Fish and Habitat

California native oak and redwood forests are favorable hosts of gypsy moth. Defoliation of these forests would expose the watersheds to excessive soil erosion and subsequent stream and river deterioration for anadromous fish. Detection and eradication of a gypsy moth population preserves the forest, maintains soil stability against excessive runoff and ultimately preserves the anadromous fish and their habitat.

Protection Assistance Programs

Agricultural Funding Programs

Williamson Act Program

The Williamson Act is a voluntary agricultural land protection program implemented by local governments with oversight and support from DOC. Forty-eight counties and more than a dozen cities participate in the program, protecting more than half of the state's 30 million acres of agricultural land, including 5 million acres of prime farmland. The goals of the program are:

- To preserve the maximum amount of the limited supply of agricultural land in order to conserve the state's economic resources and assure an adequate, healthful and nutritious food supply.
- To discourage the premature and unnecessary conversion of agricultural land to urban uses and to discourage patterns of discontinuous and inefficient urban growth.
- To preserve California's agricultural open space for its economic, physical, social and aesthetic values to California's rapidly urbanizing society.
- To preserve scenic highway corridors and important wildlife habitat areas for their scenic and ecological values to the people of California.

Authority

Government Code Sections 51200 et seq. and Sections 16140 et seq.

Implementation and Follow-up

The Williamson Act is implemented locally by counties and cities. Land is protected under

the Act when local governments designate agricultural preserves and landowners within preserves voluntarily sign contracts with the city or county to keep their lands in agricultural, open space or compatible uses for at least 10 years. In return, the landowner receives preferential property tax treatment (use value taxation). The contracts automatically renew annually. To terminate, the landowner or agency can initiate nonrenewal which takes at least nine years in the case of a 10-year contract. The contract may be canceled upon the making of several rigorous findings, and the payment by the landowner of a stiff cancellation fee. Contract cancellation normally takes at least a year to consummate. The state pays the participating local governments an annual subvention based on the quality of land and number of acres under contract each year. The payments, in large part, help to offset the local property tax losses due to land enrollment in contracts.

With regard to enforcement, DOC conducts local program audits to ensure compliance with the statutes and to train local administrators on effective program implementation. In recent years DOC has enforced contracts by withholding of subvention payments and through legal action with the attorney general.

DOC issues a biennial program status report on the effectiveness of the Williamson Act programs, based on annual statistical reporting from participating cities and counties.

Specific Measures to Protect Anadromous Fish and Habitat

The Williamson Act can be used to protect habitat lands designated by the local government after consultation with DFG. Also, wetlands and intertidal lands can be protected under a Williamson Act contract. Subvention entitlements would be paid on such lands. DOC is not aware of any local jurisdiction which has established an agricultural preserve primarily for the protection of habitat, although at least one county has designated the primary purpose

of their agricultural preserves as the protection of watersheds.

Agricultural Land Stewardship Program (ALSP)

DOC commenced administration of the ALSP in the fall of 1996. The ALSP is designed to support the efforts of local governments and non-profit land trusts in working to conserve important agricultural land resources that are at risk of being converted to non-agricultural uses. The ALSP provides grants to these entities to purchase voluntary agricultural conservation easements on targeted lands to maintain them in agricultural production in perpetuity.

Authority

Division 10.2 of the Public Resources Code sets out the procedures for soliciting and awarding grants for the purchase of easements, as well as land restoration work on easement lands.

Implementation and Follow-up

Agricultural conservation easement agreements are developed with cities, counties, and non-profit land trusts. DOC maintains reversionary authorities should holders of agricultural conservation easements fail to perform as required in individual agreements. Each local entity is responsible for maintaining a monitoring program for easements acquired with ALSP funds.

Specific Measures to Protect Anadromous Fish and Habitat

The ALSP is authorized to expend up to 10 percent of available grant funds on land restoration work on easement lands. However, no such grant proposals have been made in the initial two year of administration. Several easements completed thus far have also included protection of adjacent riparian habitats.

Rangeland Water Quality Plan

Nonpoint source pollution from past and present land uses, including agriculture and forestry, has a significant impact on *Salmonid* habitat values along coastal rivers and their tributaries. The listing of 17 north coast rivers as “impaired” under section 303(d) of the Clean Water Act and the listing of the coho salmon documents the challenge to landowners, communities, and government. The development of Total Maximum Daily Load (TMDL) targets for sediment or temperature on 17 north coast rivers further focuses attention on agriculture and forestry production and harvest practices.

The Rangeland Water Quality Management Plan, which was formally adopted by California Department of Forestry and Fire Protection (CDF) in July 1995, provides a mechanism for rangeland managers to address water quality and fishery needs. Both the State Water Resources Control Board and Environmental Protection Agency (EPA) Region IX have supported this approach. To date, plans for more than 300,000 acres of range land have been adopted. Landowners and supporting organizations (such as UC Extension (UCCE), RCD's, the California Farm Bureau and the California Cattlemen's Association) are adapting this mechanism to serve new and broader purposes.

The Rangeland Water Quality Plan process is a voluntary process developed by range industry, conservation groups and State and federal agencies to comply with CWA, Porter-Cologne, and CZARA. The planning process emphasizes the use of site specific management practices. The Plan process consists of the following elements:

- assessment
- management strategy
- implementation of practices
- monitor
- adjust.

The Rangeland Water Quality Management Plan has the potential to be a significant element of the overall California Watershed Protection Program. As such, it could significantly contribute to providing the conservation commitment sufficient to enable NMFS to rely upon the State program as adequate to conserve anadromous salmonids.

Whether voluntary or required by regulation, it is the private landowner and manager who will develop water quality plans, implement best management practices and monitor water quality for California's 8 million acres of cropland, 20 million acres of privately owned rangeland, and 7.2 million acres of private forestland with commercially available timber.

Most landowners rely on their traditional sources of information: UC Cooperative Extension, USDA Natural Resources Conservation Service, Resource Conservation Districts, and such Industry Organizations as the California Farm Bureau and the California Cattlemen's Association. These same organizations, as well as others, are supportive of the Rangeland Water Quality Management Plan approach. Representatives of these organizations, as well as regulatory agencies, have been informally exploring ways to better support the Rangeland Water Quality approach as a means for landowners to meet State and federal water quality and ESA requirements.

The following Pilot concept describes a program of increased private landowner education and technical assistance that relies on the existing institutions with whom landowners have a history of trust and cooperation: University of California Cooperative Extension, USDA Natural Resources Conservation Service, local Resource Conservation Districts, local Farm Bureaus, and the California Cattlemen's Association.

A Pilot UCCE Program for California's Coastal Watersheds

Several statewide landowner associations are asserting a leadership role in developing and implementing a private sector, voluntary, non-regulatory nonpoint source control program. They believe that putting nonpoint source controls in place on the ground is the best way private sector agricultural organizations can protect their members against overly burdensome, rigid, governmental management prescriptions.

The goal is to satisfy the water quality standards of the State under the State's Porter-Cologne water Quality Act and State Basin Plans, the federal Clean Water Act, the federal coastal Zone Act Reauthorization Amendments, and State and federal endangered Species Acts.

While UC Cooperative Extension has five livestock and natural resource advisors, six marine advisors, and two rangeland specialists delivering the Rangeland Watershed Program in 16 coastal counties, each has numerous duties that prevent them from spending full time on this issues. A meaningful expansion of the Program would place five regional watershed advisors along the coast from Santa Barbara County to Siskiyou County and to have an existing cadre of more than 20 specialists provide them with technical support. To strengthen specialist support, the Program would add an anadromous fish specialist, restoration specialist, and natural resource social science specialist.

Objectives of Proposal

The increased support for the Rangeland Water Quality Management Plan would:

- Help landowners and other stakeholders start watershed groups and facilitate group processes that achieve agreement on a course of action documented in a watershed plan.
- Support private landowners in the development of farm, ranch and watershed plans that address clean water, endangered species, wildlife

habitat and other environmental issues.

- Provide technical support in the implementation and evaluation of management practices that reduce the impact of farm and ranch operations on clean water, endangered species and habitat.
- Support landowners in the development and maintenance of water quality, watershed or habitat monitoring.
- Document the effectiveness of the program.

Overall, the intent is to better support and assist landowners in managing their lands consistent with protection of water quality and associated beneficial uses. The Rangeland Water Quality Management Plan was created as a voluntary option for landowners. This voluntary approach is the heart of Tier One of the State's Non-Point Water Quality Program . This proposal is consistent with that intent.

Agency and Organizations Roles

Under the draft proposal, agencies and organizations would support landowners and watershed groups as follows:

- **Resource Conservation Districts:** The RCD would organize watershed groups, seek funding to support projects, involve appropriate stakeholders, be the contact point for regulatory agencies.
- **USDA Natural Resources Conservation Service:** Provide technical assistance to landowners during the preparation and implementation of conservation, water quality and watershed plans. Help landowners acquire EQUIP funding to support conservation practices.
- **UC Cooperative Extension:** Develop and conduct education, demonstration, and research

programs that support development and implementation of individual property and watershed plans and monitoring programs that facilitate voluntary compliance with clean water and habitat protection requirements of law. Document the effectiveness of the program, including monitoring component.

- **California Farm Bureau Federation:** The California Farm Bureau Federation's Nonpoint Source Initiative promotes the formation of local watershed working groups of agricultural landowners, which would identify agricultural nonpoint source pollution water quality problems in their watershed and develop feasible, flexible controls. Through its Nonpoint Source Initiative, the Farm Bureau would continue to promote the use of the Rangeland Water Quality Management Plan for agricultural landowners. The State Farm Bureau would also work with appropriate governmental agencies and the U.C. Cooperative Extension to identify needed technical assistance, and certify assessment and monitoring protocols. With a farm and ranch family membership over 40,000 and county Farm Bureaus in 56 counties, Farm Bureau has the means to reach many of California's farmers and ranchers.
- **California Cattlemen's (CCA):** Having helped create the Rangeland Water Quality Management Plan, they would continue to promote and support its utilization. CCA would continue to promote Educational Workshops provided by U.C. Cooperative Extension and NRCS to educate producers on water quality concerns. These workshops have been conducted around the State starting extensively in 1996. Finally, CCA would continue to promote and support range management professionals being certified under the guidelines set by the California Board of Forestry.

- **State and federal Agencies (CAL-EPA, Resources Agency, EPA, SWRCB, RWQCB, NMFS, F&WS, CDF, CDFG, etc.):** Several of the State and federal agencies have both statutory responsibilities and regulatory authority on water quality and species protection. These entities, however, are seeking creative, flexible and innovative approaches that incorporate cooperative and voluntary actions as alternative mechanisms to the traditional "command and control" approach. These entities seek to work with landowners, their representative organizations and other community interests in better supporting and recognizing the type of voluntary, cooperative approach embodied in the Rangeland Water Quality Management Plan. These agencies would provide information on watershed/habitat assessment and goals to watershed groups and provide project funding when it is available. The relevant regulatory agencies would also review and certify protocols for the conduct of assessments and monitoring, as well as a "toolbox" of conservation measures to assist landowners in achieving their water quality and habitat responsibilities.

This concept will be further refined and explored as a possible element of the California Watershed Protection and Restoration Program.

Soil Resources Protection Program (SRP)

In 1937 the U.S. Congress passed the Standard State Conservation District Law. This law encouraged states to form special districts for the purpose of addressing growing problems of soil erosion and watershed management. California responded in 1938 with the addition of Division 9 to the state's Public Resources

Code. Division 9 enabled the formation of Soil Conservation Districts (later renamed Resource Conservation Districts, RCDs) as special districts. Simply put, districts are local units of government organized by local residents under state law. They operate on the premise that local people know more about local problems than anyone else. Today there are 103 RCDs in California, providing services to 83 percent of California's land.

Authority

Division 9 of the California Public Resources Code.

Implementation and Follow-up

At the state level, assistance is provided to RCDs by DOC's Soil Resources Protection Program (SRP). Technical staff coordinate the California Conservation Partnership (a partnership that brings together state, federal and local agencies with the responsibilities and skills to manage California's valuable and limited land and water resources through California's local RCDs), assist in producing a newsletter for RCDs, conduct RCD training, assist in the formation and consolidation of RCDs, and serve as a liaison with other state, local and federal agencies.

Additionally, the RCDs are recipients of various state and federal grants for stewardship and restoration projects and are assuming a stronger role in watershed planning in some areas of the state (e.g., the *Fish Friendly Farming* 205(j) project and watershed stewardship funding under 319(h) in the Russian River watershed).

Specific Measures to Protect

Anadromous Fish and Habitat

While the SRP does not specifically provide measures to protect anadromous fish, the program does contribute to the overall health of California watersheds through stewardship programs, education and actual stream restoration projects, primarily through its work with RCDs.

The SRP is assisting in implementing the Russian River Watershed (RRW) effort. The Governor's Watershed Protection and Restoration Council (WPRC) views the Russian River Watershed effort as a pilot project for an integrated approach to watershed protection, restoration, and enhancement. The RRW group will provide regular progress reports to the Governor's Watershed Protection and Restoration Council. The WPRC intends to use the RRW effort as an example of how integrated and coordinated watershed planning led at the local level can work to protect, restore, and enhance the environmental and economic health of California's watersheds.

This coordination effort will be complex involving multiple counties, numerous state, federal and local agencies (including three local RCDs), and diverse and varied interests within the watershed. The RRW effort will be further complicated by recent listings of coho salmon and steelhead trout as threatened species under the Endangered Species Act. As currently structured, the RRW group has no committed staff to oversee coordination efforts. Secretary for Resources Agency, Douglas P. Wheeler, appointed Larry Goldzband, Director of the Department of Conservation, to lead a State team to assist in the efforts of local government and other interested parties in the restoration, protection and enhancement of the watershed. Until a full-time coordinator is hired, the SRP is providing support for the preliminary planning stages from a temporary redirection of existing staff.

A citizen advisory committee produced a soil conservation plan in 1990. The plan included recommendations regarding financial support, on a cost-share basis, for basic RCD operations and for the administration of technical and educational programs. There is currently no state funding of the operations of RCDs. Another recommendation called for the establishment of an RCD grant program for locally initiated watershed restoration projects. The governor's 1996/97 budget contained \$120,000 to initiate an RCD grant program under DOC. Continued funding for the RCD

grant program was proposed in the governor's 1997/98 Watershed Initiative at a funding level of \$750,000, but was eventually approved by the Legislature and included in the adopted budget at the previous year's funding level of \$120,000.

The governor's 1998-99 budget proposes continuation of this grant program.

The plan also proposed creation of RCD area field representatives to function as ombudsmen to facilitate bridging, blending and brokering the delivery of conservation program resources among state, federal and local agencies and through RCDs. A two year pilot project testing the merits of RCD field representatives is now underway in the San Joaquin Valley with a one-time grant of NRCS funds and a small match of DOC watershed funds. The second quarter report from this test project describes how the field representative assists RCDs in understanding their powers and authorities under Division 9, developing ongoing strategic plans, publicizing RCD activities and locating resources and partners to complete watershed projects.

Farmland Mapping and Monitoring Program (FMMP)

The FMMP conducts land use inventories on California's urban and agricultural lands to determine the quality, location and conversion activity occurring on over 44 million acres of private land in the state. Currently, five agricultural classes are mapped, as well as urban lands, miscellaneous non-agricultural lands and water areas. Land use information is prepared for areas that have modern USDA-NRCS soil surveys prepared. The program maps and monitors land use change on private agricultural and open space land. Maps and statistics depicting land use categories for all program counties are provided to local agencies to assist in their management of agricultural land.

Authority

Government Code Section 65570 mandates the FMMP to biennially report to the Legislature on the conversion of farmland and grazing land, and to provide maps and data to local governments and the public.

Implementation and Follow-up

The FMMP is implemented by the DOC. Land use information is supplied to the Legislature and local governments on a biennial basis. The program is non-regulatory; there is no component of the program which forces local or state agencies to use the information for land use planning, development or preservation. DOC issues biennial land use conversion reports and important farmland maps for information purposes only.

Specific Measures to Protect

Anadromous Fish and Habitat

The FMMP produces detailed land use maps which may be used to help protect habitat lands designated by the local government after consultation with the director of DFG. These maps show the location and extent of various land uses, including perennial water bodies, and their interpretation may offer information valuable to the assessment of habitat suitability or potential threats to habitat.

Fertilizer Research and Education Program (FREP)

CDFA's Fertilizer Research and Education Program (FREP) was created in 1990 to advance the environmentally safe and agronomically sound use and handling of fertilizer materials. Most of FREP's current work is concerned with nitrate contamination of groundwater.

FREP facilitates and coordinates research and demonstration projects by providing funding, developing and disseminating information, and serving as a clearinghouse of information on this topic. FREP serves growers, agricultural supply and service professionals, extension personnel, public agencies, consultants and other interested parties.

The program supports 61 projects at a projected cost of \$3 million, and \$2.5 million in matching funds. Of these 61 projects, about half have been completed. Details about these projects and the information products available can be found in program publications.

Authority

In 1990 CDFA was authorized to increase the mill tax on fertilizers to conduct research and education projects to advance the environmentally safe and agronomically sound use and handling of fertilizer materials.

FREP participates in interagency activities to reduce nonpoint sources of contamination and a University of California study team that developed methods to assess the environmental and agronomic performance of various BMPs, and is a member of various advisory committees. Regulatory and legislative trends on nitrogen management across the country are also monitored.

FREP also maintains baseline information on fertilizer practices of target crops. Additional activities include monitoring scientific, technical, agricultural, industrial and policy developments, and issues related to the program goals. Though the program concentrates on nitrates in groundwater because of human health concerns (the U.S. EPA maximum contaminant level is 10 mg/liter nitrate-nitrogen; nitrates are known to cause "blue baby" syndrome in infants and young children), surface water quality is enhanced when fertilizer efficiency is improved.

Implementation and Follow-up

FREP operates in a voluntary manner. Outreach efforts include publications, videos, conferences, grower field days and demonstrations. The goal of the program is to research alternative fertilizing strategies that result in efficient fertilizer use while maintaining yield and quality. FREP also focuses on educating growers on best management practices for many California cropping systems.

Follow-up on the adoption of BMPs is monitored by surveying growers on the rates of adoption of BMPs and fertilizer use. A recent survey of growers shows that although growers have significantly improved irrigation management, there has not been a significant reduction in fertilizer use. Growers have moved away from only one surface application and there has been a significant increase in the number of growers using foliar applications of N fertigation and soil and plant tissue testing.

In many instances, the research on alternative fertilizer management strategies has only just been completed. An appropriate length of time must be given to growers to become familiar with these techniques, experiment with them on a limited acreage, and adopt improved management strategies and expand their use.

Specific Measures to Protect

Anadromous Salmonids and Habitat

The purpose of the program is to optimize fertilizer use efficiency in many of California's cropping systems. Primary water quality concerns for anadromous fish are water temperature and sediment loading, but pesticide and nutrient loading are also significant.

With more than 200 crops grown in California, it is impossible to develop adaptive research and outreach projects to effectively address every situation. Therefore, the FREP approach has been to concentrate on those farming systems that pose the highest potential threat and where payoffs appear most promising. Most of its work focuses on two agricultural systems, cool-season vegetable crops grown in California's coastal areas and the fruit and nut tree crops of the Central Valley.

FREP program goals, though supported by the fertilizer industry leadership, have not yet been effectively translated into clear incentives to their workforce, particularly to the salespeople.

Fertilizer is inexpensive relative to other production inputs and their market value. The potential savings from fertilizer use reduction may be perceived as not worth the increased risk of potential loss of crop yield or quality. Given the uncertainties of crop production, applying more fertilizer than may be needed is a rational management strategy. Over-application of fertilizer is probably seen by many growers as an inexpensive insurance program.

Because some populations of anadromous fish spend a significant portion of their lives in rivers and streams, they are susceptible to human induced changes to water quality. More efficient use of fertilizer will lead to a decrease in nonpoint source contamination of groundwater and surface water, thereby improving the habitat for anadromous fish populations.

Nonpoint Source Funding Programs

The SWRCB administers funds for watershed management planning and implementation projects which reduce, eliminate or prevent water pollution and enhance water quality. Specifically, federal funds are available for water quality planning and assessment (CWA Section 205[j]) and nonpoint source implementation programs (CWA Section 319[h]), and state funds are available through Proposition 204 (Agricultural Drainage Management Construction Loans and Delta Tributary Watershed Grants).

205(j) Program

Annually, the anticipated funding level in the 205 (j) program ranges between \$400,000 to \$750,000. Eligible activities include development of watershed plans or other planning functions designed to resolve actual or potential water quality issues. Proponents must show that a coordinated approach with relevant agencies and stakeholders will be employed. Only local

public agencies are eligible for grant funding. Grants must be matched with at least 25 percent non-federal funds.

319(h) Program

Annually, the anticipated funding level in the 319(h) program is approximately \$2.5 million. Eligible activities include the implementation of BMPs for agricultural drainage, acid mine drainage, physical habitat alteration, channel stabilization, sediment control, hydrologic modification, dredging, silvicultural practices, livestock grazing, confined animal facilities management and others. Technology transfer, pollution prevention, citizen monitoring and educational elements of projects are eligible. Nonprofit organizations, government agencies and educational institutions are eligible to apply. Grants must be matched with at least 40 percent non-federal funds.

Proposition 204 Funds

Proposition 204 provides up to \$27.5 million in loans and up to \$2.5 million in grants for drainage water management units (works or facilities). Any political subdivision of the state involved with water management is eligible.

On May 27, 1998, the State Water Resources Control Board approved funding of 16 proposals for a total of \$10.2 million of the available \$14.5 million. Approved proposals including activities such as watershed planning, watershed restoration and enhancement, monitoring, hazardous fuels reduction, and watershed education programs. Grant recipients included counties, resource conservation districts, and local water and flood control agencies. The remaining \$4.3 million in Delta Tributary Watershed Program grant funds will be distributed via an RFP that was released in mid-June 1998.

Watershed Sponsored Protection Activities

Resource Conservation District Programs

Napa Resource Conservation District is implementing a citizen's monitoring program. A network of stations has been established and multiple environmental indicators are measured. This data will be incorporated in the Regional Board's water quality assessment report (305[b] report).

Association of California Water Agencies

Under the California Resources Agency, the Coastal Salmon Initiative (CSI) attempted to develop measures to implement in the near-term for the protection of anadromous salmonids. While the CSI effort has terminated, the Watershed Protection and Restoration Council encompasses its goals as a part of a broader effort. In response to the CSI, representatives from the Association of California Water Agencies (ACWA) have developed measures for affected water agencies. ACWA members compiled a list of past, continuing and future measures and reports, studies and data which would be relevant to CSI.

The information compiled by ACWA members is summarized below. Although coho salmon are not present in the jurisdiction of several of the water agencies which submitted information, these agencies were included since steelhead trout are

within their service areas. While these measures represent both protection and restoration elements, they are summarized below for referencing convenience

Humboldt Bay Municipal Water District

The Humboldt Bay Municipal Water District (HBMWD) operates Ruth Dam at approximately river mile 80 on the upper Mad River. Water released from Ruth Dam travels downstream to HBMWD's Ranney collectors and surface water diversions on the lower Mad River (approximately river mile 5). USFS administers approximately one-third of the upper watershed, while the remaining two-thirds is in private ownership. The majority of the middle reach of the lower Mad River is under HBMWD ownership.

Fisheries Resources

The Mad River Watershed supports both coho salmon and steelhead trout (*Oncorhynchus mykiss*). Lindsay and Maple creeks have been the primary tributaries observed to support coho salmon. Coho counts at Sweasey Dam from 1938 through 1952 averaged 396 fish per year. Counts dropped to 37 fish per year following major flooding in 1952 and 1954. Coho stocking began in 1957, and runs enlarged to an average of 1,137 fish.

Fish habitat was heavily degraded during the flood of record in 1964. The Mad River hatchery began operation in 1971, and coho production averaged 485 fish per year over the following 21 years. Studies completed in 1994 estimated the average run size of "naturalized" coho at 460 adults, but the actual abundance of "natural" or "naturalized" coho in the Mad River is not known.

Proposed Measures

HBMWD's operations will be reviewed to identify existing or potential impacts of ongoing practices to coho salmon abundance, distribution or habitat. For

example, HBMWD will evaluate its existing surface water diversion screen. Mitigation measures will be prepared if impacts are identified. Opportunities to restore and enhance salmon habitat or “natural” populations will be identified during the operations review.

HBMWD has – and will continue to – encouraged and facilitated the development of a coordinated Mad River anadromous species habitat conservation plan with other major stakeholders. The CSI effort may provide the coordinated nexus to accomplish this measure.

Coho salmon habitat in pool-run habitat can be enhanced by increasing complexity and shelter through the introduction of LWD. Five areas in the middle reach of the lower Mad River will be identified for the introduction of LWD. Three coho refugia pools can be enhanced by increasing depth and volume. Three areas in the middle reach of the lower Mad River will be identified for pool enhancement.

HBMWD will prohibit all instream salvage logging of LWD and instream mining on its properties in the middle reach of the lower Mad River. The district will continue to prohibit vehicular access to its properties along the middle reach of the lower Mad River from October through January to reduce poaching and fishing pressure on migrating adult coho salmon.

HBMWD may be able to assist adult migration by augmenting flows released from Ruth Dam during November-January and May-June if it is determined to be necessary by either DFG or NMFS to protect coho salmon.

Habitat inventory and assessment of the suitability of HBMWD's properties in the middle reach of the lower Mad River for anadromous salmonid migration, spawning and rearing was conducted in the summer-fall of 1994 by Trinity Associates. Also in 1994, Trinity Associates developed a comprehensive streambed morphology monitoring protocol for the middle reach of the lower Mad River.

HBMWD participated in the first complete summer steelhead survey of the Mad River from Ruth Dam to the estuary in 1995.

Sonoma County Water Agency

The Sonoma County Water District (SCWA) diverts water from the Russian River through a series of wells and Ranney collectors in the vicinity of Wohler and Mirabel. Water releases into the Russian are controlled by Warm Springs Dam on Dry Creek and Coyote Dam on the East Fork of the Russian River and have been augmented by diversions from the Eel River via the Potter Valley Project. Although there is not substantial hydrologic history, it is believed the Russian River would frequently go dry during summer and early fall prior to water development and Eel River augmentation.

Fisheries Resources

The Russian River supports a diverse assemblage of native and non-native fishes. Anadromous salmonid species include coho and chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout. Chinook salmon are relatively uncommon in the basin and are the only anadromous salmonids which spawn in the main channel of the river. Coho and steelhead spawn in the tributaries and use the Russian River only as a migration corridor.

Historically, the Russian River was one of the premier salmonid fisheries in California. All of the anadromous salmonids in the Russian River Basin now are in decline. Declines are attributed to habitat degradation, introduction of non-native species, interactions with hatchery stock, agriculture, timber harvest, water development and urbanization. In an effort to facilitate the recovery of anadromous salmonid stocks, SCWA started the Russian River Fisheries Enhancement Program (RRFEP) in 1995. The RRFEP will enhance fisheries habitat in Russian River tributaries through restoration and enhancement projects, data collection, education and community outreach.

Proposed Measures

SCWA has hired two fisheries biologists to develop and implement the RRFEP, review agency practices and aid resource agencies with research and data collection. SCWA has begun to implement the RRFEP. RRFEP for FY 1996-97 consists of approximately 15 separate projects which include riparian restoration and fencing, habitat structures, restoration seminars, water quality assessment, elimination of fish passage barriers, stream clean-ups and habitat surveys. The budget for the RRFEP is approximately \$200,000 per year.

SCWA has drafted a cooperative agreement between the agency and DFG. The agreement will facilitate the cooperative collection of data, design of restoration projects and sharing information about the Russian River Watershed.

Reports, Studies and Data

SCWA is currently assisting DFG with habitat surveys of the Russian River Watershed. SCWA dedicated one full-time employee and a full-time student intern for the entire summer to this task.

SCWA retained a consultant to prepare a report to analyze and chronicle the fisheries declines in the Russian River. The final report, *A History of the Salmonid Decline in the Russian River*, was published in August 1996.

Marin Municipal Water District

The Marin Municipal Water District (MMWD) operates a total of seven dams in Marin County. Four dams divert water from Lagunitas Creek, one from Nicasio Creek, one from Walker Creek, and one from Ross Creek. The timing and amount of water released from Kent Dam (the largest and final diversion from Lagunitas Creek) required for a sustainable fishery has been debated for many years. However, SWRCB Order WR 95-17, released in the fall of 1995,

included a new instream flow rule. In addition to increased stream flows, Order WR 95-17 mandated numerous mitigation measures and management practices. To meet previous commitments and the order's new requirements, MMWD implemented numerous protection measures.

Fisheries Resources

Lagunitas Creek contains one of the largest natural coho salmon populations remaining in California. Population estimates for Lagunitas Creek and its tributaries for the 1995-96 spawning season range from 400-700 fish. There are currently no significant hatchery operations or influences on this population of coho salmon. Lagunitas Creek is one of the only watersheds where coho populations have been increasing over the last several years. In addition to coho, Lagunitas Creek and its tributaries support a substantial steelhead population and the state and federally endangered fresh water shrimp (*Syncaris pacifica*).

Proposed Measures

MMWD has increased summer instream flows in Lagunitas Creek to the point where they exceed pre-development flows. Studies have indicated that previous release schedules were too low to support a healthy anadromous fishery. Increased flows began in 1983 and were modified again in 1996 to conform with WR 95-17. Increased flows should significantly increase summer rearing habitat for juvenile coho and steelhead.

MMWD will continue to support the ban on fishing in Lagunitas Creek which was instituted in 1992 at the request of MMWD and Trout Unlimited.

MMWD will continue to participate in an annual volunteer restoration weekend. The restoration weekend includes the construction of cover structures, gravel replenishment and erosion control work in Lagunitas Creek. MMWD contributed \$45,000 in 1993 and \$75,000 in 1995 to this cooperative effort.

In 1997 the district hired a full-time fisheries biologist to review district practices, continue monitoring fish populations, identify restoration opportunities and assist with resource management issues.

MMWD will continue to implement the Watershed Protection Agreement Program. Under this program, MMWD has developed agreements with landowners to place covenants on the titles to the land that specify acceptable and unacceptable land use practices as they pertain to water quality. To date, MMWD has entered into approximately 60 agreements.

MMWD will continue with construction and maintenance of sediment control projects in San Geronimo Creek, a major tributary to Lagunitas Creek. This joint project with the Marin County RCD is budgeted at approximately \$850,000.

MMWD will continue its ongoing salmonid monitoring studies. The district will continue selective withdrawal practices at Kent Lake to maximize the quality of water released into Lagunitas Creek and will continue to monitor water quality in salmonid habitat areas.

In 1995, MMWD published a brochure illustrating the value of LWD to the fishery. The brochure was mailed to streamside landowners and distributed at public meetings and during organized stream tours in the hopes of increasing natural recruitment of LWD into Lagunitas Creek.

Reports, Studies and Data

MMWD is preparing a sediment management plan and a riparian enhancement plan for the Lagunitas Creek watershed. The final plan was completed in June 1997. Implementation is overseen by a technical advisory board which includes state regulatory agencies.

MMWD recently completed a sanitary survey to assess the health of the entire MMWD watershed.

D.W. Kelley and D.H. Dettman conducted two studies of Lagunitas Creek for the district. In 1980 a study of relationships between streamflow, rearing habitat, substrate conditions and juvenile steelhead populations was completed. A study of relationships between streamflow, rearing habitat, substrate conditions and juvenile steelhead and coho and fresh water shrimp populations was completed in 1992.

North Marin Water District

The North Marin Water District (NMWD) obtains the majority of its supply through wholesale contracts with SCWA. However, NMWD does divert lesser quantities of water from Lagunitas Creek through wells in the vicinity of Point Reyes Station. The Point Reyes Station diversion was threatened during low flow periods by potential salt water intrusion but was generally protected during these periods by the installation of the summer dam at the Giacomini Ranch. Although the dam's design included measures for anadromous salmonid passage, installation of the summer dam has been a subject of environmental debate for many years. However, SWRCB Order WR 95-17 mandated permanent removal of the Giacomini Dam. Removal may require NMWD to relocate its diversions on Lagunitas Creek to a location upstream of tidal influence.

Fisheries Resources

Anadromous fisheries resources affected by NMWD operations are limited to the vicinity of its diversions on Lagunitas Creek. NMWD operations are not in the vicinity of its diversions on Lagunitas Creek or coho or steelhead breeding habitat. The Giacomini Ranch summer dam, which the NMWD relied upon for salinity protection, may have had some effects on salmonid migration and estuary habitats.

Proposed Measures

The NMWD may relocate their diversions from Lagunitas Creek to a location farther upstream. This will allow the NMWD to

continue to provide water to the town of Point Reyes Station without the annual construction of the Giacomini Ranch summer dam. Eliminating the summer dam will allow the lower reach of Lagunitas Creek to establish a more natural salinity gradient (important during smoltification) and provide uninterrupted migration.

East Bay Municipal Utility District

The East Bay Municipal Utility District (EBMUD) operates various utility services in the San Francisco Bay region. Although not a coastal utility, EBMUD does have projects which obtain supply from San Leandro Creek which flows into San Leandro Bay.

Fisheries Resources

In 1855 Dr. G.W. Gibbons described a separate and distinct species of coastal (steelhead) rainbow trout (*Salmo irrideus*) from specimens collected in San Leandro Creek. The construction of Chabot Dam in 1875 and Upper San Leandro Dam in 1926 on San Leandro Creek have isolated the stock described by Gibbons for over 120 years. Studies conducted by A.E. Gall, Boyd Bentley and R.C. Nuzum in 1986-87 concluded that the stocks isolated above the dams were a “unique scientific resource due to their unprecedented genetic integrity” and may represent some of the only remaining non-hybridized coastal steelhead in California.

Proposed Measures

EBMUD will continue to prohibit angling and fish stocking of any type into Upper San Leandro Reservoir. Also, the district will actively control poaching in Upper San Leandro Reservoir and all of its tributaries.

EBMUD will work with DFG monitor spawning habitat and fish passage at road crossings.

Reports, Studies and Data

EBMUD completed its Watershed Master Plan in 1996. The plan describes management practices for all of EBMUD’s East Bay watersheds, including Upper San Leandro Reservoir. EBMUD also recently completed a sanitary survey to assess the health of the entire district watershed.

In 1986-87, A.E. Gall, Boyd Bentley and R.C. Nuzum conducted studies of rainbow trout in Kaiser and Redwood creeks in Contra Costa County.

City of Santa Cruz Water Department

The City of Santa Cruz Water Department (CSCWD) operates the Felton Diversion on the San Lorenzo River. The diversion facilities include the annual erection of an inflatable dam. When the dam is fully inflated, water is discharged through a fish ladder designed for the passage of adult steelhead and coho salmon.

Fisheries Resources

Historically, both coho salmon and steelhead trout were in the San Lorenzo River. Currently, coho numbers in the San Lorenzo River are extremely low, and may have been extirpated. CDFG has had some concerns that fish passage at the inflatable dam may be unsatisfactory when water spills over the top of the dam, detracting from the effectiveness of the fishway’s attraction flows.

Proposed Measures

CSCWD has recently negotiated a memorandum of agreement (MOA) with DFG which establishes test protocol to evaluate the effect of various operations and structural changes to the city’s diversion facility designed to enhance fish passage during inward and outward migration.

CSCWD will continue to support and grant facility access to the Monterey Bay Salmon

and Trout Project. This project traps fish at the diversion facility and moves them to fish hatching and rearing facilities for eventual release to area streams. An important goal of the Monterey Bay Salmon and Trout Project is the re-introduction of self-sustaining coho populations into local streams where they have become extinct.

Reports, Studies and Data

CSCWD recently completed a sanitary survey to assess the health of the entire CSCWD watershed.

Monterey Peninsula Water Management District

The Monterey Peninsula Water Management District (MPWMD) is a special district created by the California Legislature in 1977 and ratified by the voters in 1978. The MPWMD's mission is to manage, augment and protect water resources for the benefit of the community and the environment.

The Monterey Peninsula depends solely upon variable local sources, primarily surface and groundwater from the Carmel River Basin, to meet its supply needs. About 95 percent of the customers within the district are supplied with water by the California-American Water Company.

Fisheries Resources

The Carmel River is south of the known distribution for coho salmon, but it does support a steelhead fishery. Problems facing the Carmel fishery have included river mouth closures, erosion, drought and urbanization.

Proposed Measures

The MPWMD is in the final phases of implementing a mitigation plan adopted in 1990. The mitigation plan included a comprehensive steelhead fishery enhancement component that included smolt

and juvenile rescues and the passage analysis at supply facilities.

Private Sector Efforts

California Farm Bureau Federation

Private landowners in California have provided strong leadership on many watershed groups throughout the state, including Humboldt Fish Action Council, Big Chico Creek Task Force, Mattole Restoration Council, Greenwood Creek Watershed Project, Eel River Watershed Improvement Group, Scott River Watershed CRMP, Butte Creek Watershed Conservancy, Mill Creek Conservancy and Deer Creek Conservancy. These areas comprise over 1 million acres of watersheds.

California Cattlemen's Association

The Cattlemen's Association has supported educational workshops and assisted in the development of water quality plans for 300,000 acres of private rangeland (100,000 in Ukiah and 200,000 in San Luis Obispo).

Pacific Lumber Company

In 1995 Pacific Lumber Company stabilized 193 sites where road failures were likely to deliver sediment into watercourses. These "armoring" efforts are estimated to have prevented 11,409 cubic yards of erosion. Documentation of this work will be used for mitigation on future timber harvest plans.

Watershed Interest Groups

A discussion of restoration efforts by watershed interest groups is presented in Chapter 5.

Other Entities Involved in

Protection Activities

Federal Agencies

- Environmental Protection Agency
- Army Corps of Engineers - This agency has constructed and operates the two major dams on the Russian River: Lake Mendocino on the East Fork at Ukiah and Lake Sonoma on Dry Creek near Healdsburg. The Army Corps is also responsible for administering the CWA Section 404 permits on dredge and fill activities. They are in the early stages of a reconnaissance survey of the Russian River basin preparatory to a study of potential actions to improve aquatic and geomorphic functions.
- Geological Survey
- National Biological Service
- Fish and Wildlife Service
- National Marine Fisheries Service
- Natural Resources Conservation Service
- USBR

Other California State Agencies

- California Coastal Conservancy - This agency began a Russian River enhancement program in 1991, involving two Technical Advisory Committees (Sonoma and Mendocino Counties) to identify issues on the mainstem and develop alternatives to enhance public access and the resource values of the mainstem Russian River.
- UC Cooperative Extension - In conjunction with NRCS, workshops to educate California Cattlemen's Association members were provided in 1996 in Ukiah, Sunol, Tomales, Glennville, Visalia, San Andreas, Red Bluff, Oakdale, Sacramento, Merced, Sonoma, Gilroy, San Luis Obispo and Oroville.
- UC Davis
- State Lands Commission

- Sonoma State University

Other Institutions

- Bodega Marine Laboratory
- Farallones Institute
- Eel/Russian Commission - This commission was formed to coordinate water resources issues in the two basins in light of their sharing a common headwaters with the Eel-to-Russian interbasin diversion

Native American

Pomo Basket Weavers

Public Interest Groups

- Green Valley Creek Watershed Advisory Group (WAG)
- Laguna Foundation - This nonprofit organization is committed to protection and enhancement of the wetlands and other resource values of the Laguna de Santa Rosa.
- Laguna Coordinated Resource Management and Planning (CRMP) Task Force - This facilitated effort was started by the City of Santa Rosa and the Sonoma County Water Agency in 1994 to identify and help resolve issues in the Laguna de Santa Rosa watershed. Membership is extensive, including local, state and federal agencies, public interest groups, individual landowners, and interested persons. The Task Force completed a management plan to assist in protecting and improving the resources in the watershed in early 1995.
- Stemple Creek WAG
- Russian River Watershed Protection Committee
- Friends of the Russian River
- Russian River Alliance
- Vernal Pool Task Force
- Environmental Resource Council

- Sonoma County Taxpayers Association
- Trout Unlimited
- Salmon Unlimited
- Citizens for Cloverdale
- Committee for Sensible Reuse
- Surfrider Foundation
- San Luis Obispo Land Conservancy
- Central Coast Salmon Enhancement
- CAL-TROUT
- PCFFA
- Salmonid Restoration Federation
- North Coast Environmental Center
- EPIC
- Mattole Restoration Council

CHAPTER V

RESTORATION PROGRAMS

Introduction

Restoration of California's anadromous fish populations has been supported by private, local and state interests for many years. For example, in the past 17 years, the state has spent over \$87 million on restoration projects that directly benefit anadromous fish. The Salmon, Steelhead and Anadromous Fisheries Program Act of 1988 established state policy to significantly increase the natural production of salmon and steelhead by the end of the century. This legislation also directed the Department of Fish and Game (DFG) to develop a program that strives to double the natural production of anadromous fish by the year 2000. Considerable efforts have also been initiated at the local level. Despite the combined efforts of all stakeholders, coho salmon and steelhead populations have not recovered.

The success of past and ongoing restoration activities are highlighted and serve as the basis for recommendations on the direction of future efforts. Critical to future success is the implementation of a restoration program with a framework which systematically assesses environmental conditions, sets goals and priorities, closely aligns and integrates state efforts with watershed-based efforts and uses an adaptive management approach to ensure that future efforts are successful. This framework is not only relevant to state programs, it is essential at all levels of watershed involvement, local, state and federal.

Restoration

Restoration of anadromous fish populations requires three distinct levels of effort; restoration of watersheds, restoration of streams/rivers and restoration of species. Watershed restoration focuses on sustaining the appropriate environmental conditions which influence streams and rivers. Stream/river restoration focuses on sustaining and enhancing fish habitat. Species restoration focuses on measures such as natural and artificial propagation of species. A potential fishery restoration project may include instream fish habitat improvement structures, riparian zone revegetation, bank stabilization, and/or upslope improvements.

Watershed Restoration

Land-use activities associated with logging, road construction, urban development, mining, livestock grazing and recreation have reduced fish habitat quantity and quality by changing stream bank and channel morphology, altering water temperatures, degrading water quality, and blocking access to spawning areas. Restoration of anadromous fish populations is intimately tied to the establishment of a new ethic for management of California's watersheds – an ethic that requires proposed projects to place a much higher priority on protecting essential physical, biological and ecological processes in watersheds.

Increased development and incompatible land uses can negate existing protections

for key salmonid habitat. This is especially important for riparian lands that have water rights, stream reaches which support depressed native stocks, and estuaries.

Establishing conditions, constraints and practices to maintain watershed integrity and restoring problem areas which degrade or block aquatic habitat are of the utmost importance.

Stream Restoration

Providing adequate stream flows and restoring access to headwaters are vital elements in any program to restore salmonid populations. The recent drought showed that there is little water to spare for instream uses in many areas of the state. The state needs a more effective means to identify, maintain and achieve adequate flows for anadromous fish throughout their range.

Further protections from suction dredging impacts may be necessary for some fish populations. Monitoring projects should establish whether protection measures are adequate. Stream bank alteration permits for gravel mining should include appropriate measures to ensure that fish needs are protected.

Estuaries can be important rearing areas for juvenile steelhead, especially in small coastal tributaries. The mechanical breaching of sandbars to drain lagoons and estuaries can have detrimental effects on the survival of juvenile steelhead. Alternative methods to regulate lagoon water levels and eliminate the need for mechanical breaching should be developed and implemented.

Natural and Artificial Production

Although many artificial propagation programs have succeeded in producing fish for harvests, they have generally not produced a sustained increase in the abundance of wild fish or fully mitigated for water development impacts. There is evidence that hatchery supplementation may contribute to the decline of wild populations. Two main concerns about the effects of hatchery programs on wild salmonid are loss of genetic diversity and reduction in fitness to the natural environment.

Under current state policy, natural production is the foundation for fish management and restoration. It is proposed that artificial production be limited to areas where it presently occurs, and its use be expanded only if necessary to prevent the extinction of a native run, or if the native population has already become extirpated and the habitat is irrevocably altered.

Existing hatchery and rearing programs should be operated to minimize impacts to natural stocks. Accordingly, DFG plans to mark all hatchery production fish prior to release to provide a solid foundation to actions necessary to protect natural stocks.

Restoration Program Framework

The framework of a successful statewide restoration program should resonate with and be complementary to the framework of successful local-based watershed restoration programs and vice versa. There should be a similar relationship with federal programs. Essential components of the framework follow:

- ***Watershed analysis and assessment*** - environmental conditions must be reviewed and benchmark conditions defined.
- ***Watershed management planning and strategies*** -

stakeholders must work together to develop and agree on restoration goals and priorities.

- **Efficient use of resources** - projects proposed for funding must receive a coordinated review to ensure technical adequacy and feasibility, implementation of priority activities and effective use of limited resources. Such methods used by the CALFED Program in coordinating requests for proposals (RFP) and using review teams is a model for statewide implementation
- **Funding support** - additional funds must be committed by private interests and local, state and federal government/agencies for restoration and monitoring efforts.
- **Monitoring and adaptive management** - environmental measurements must be conducted to provide feedback on actions taken and to focus research.

The balance of this chapter presents more detail on the stage-setting and mobilization components of the restoration program framework. Additionally, an inventory of existing efforts and model restoration programs is presented. Details related to monitoring and adaptive management are presented in Chapter 6.

Review of Watershed Conditions

Watershed Analysis And Watershed Assessment

Watershed analysis is a method of looking at larger landscapes, an entire watershed, for a specific planning purpose. Watershed

analysis is best conducted by interdisciplinary teams of qualified resource specialists with involvement by the various government agencies, general public and local landowners. This approach is the underpinning of the state's approach to watershed protection and restoration.

Watershed analysis theory was advanced recently by the federal government. Seven federal agencies collaborated to focus and redefine watershed analysis needed for implementing the Aquatic Conservation Strategy set forth in the President's Northwest Forest Plan in 1993. Their efforts produced a procedure that characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions (collectively referred to as ecosystem elements) within a watershed. Federal agencies are the primary users of this approach which is outlined in detail in "Ecosystem Analysis at the Watershed Scale - Federal Guide for Watershed Analysis - Revised August 1995, Version 2.2." The federal analysis process has six steps to tell a "watershed story":

- 1) Characterization of the watershed.
- 2) Identification of issues and key questions.
- 3) Description of current conditions.
- 4) Determination of reference conditions.
- 5) Synthesis and interpretation of information.
- 6) Recommendations.

Watershed analysis provides a context for all subsequent decision-making, including planning, project development, and regulatory compliance.

Watershed assessment is the systematic review of resources, such as fish, their habitat and riparian areas, in a watershed. The scale of the assessment can be as large as an entire watershed or as small as a specific subbasin. Spatial as well as temporal elements are considered in assessments.

Like watershed analysis, watershed assessment is a stage-setting process, but it is more focused on targeted resources.

This approach is used in areas where greater understanding is needed or where controversy exists. Essentially, data collection and field inventory is focused on key sensitive sites within an assessment area to answer questions about the targeted resource. The location of these sites is determined by reviewing existing information, engaging skilled personnel and interviewing people who have site-specific knowledge. Watershed assessments provide baseline information for subsequent evaluation of a project and monitoring of watershed conditions.

Methods of Watershed Analysis/Assessment

The most thoroughly implemented version of watershed analysis is that being used in the State of Washington to evaluate cumulative effects in watersheds with multiple landowners (Washington Forest Practices Board Manual: Standard Methodology for Conducting Watershed Analysis - Version 2.1 - November 1994). This method is of specific relevance to forest lands.

In the state of Washington methodology, interdisciplinary representatives of forest-related interests in each 40 to 200 square kilometer watershed work together to identify causes of environmental change and to define area-specific standards and guidelines that would avoid detrimental changes. Evaluation focuses on the effects of timber management on fisheries and water quality; wildlife issues are not addressed. A feature of the program is voluntary adherence to the analysis recommendations. For those who follow the recommendations, an incentive is built into the program; they will not be subject to further environmental assessment work.

In 1994, DFG developed a "Coho Salmon Habitat Impacts, Qualitative Assessment Technique for Registered Professional Foresters, 1994" (Steele, Stacey). This was in response to a request by the Board of Forestry to assist in determining the cumulative impact for timber plans and to design mitigation measures. The method

involves information gathering, site analysis and looking for forensic evidence of past problems.

DFG uses a habitat assessment method described in the "California Salmonid Stream Habitat Restoration Manual" (Flosi and Reynolds, 1994) to assess the condition of stream habitats and determine the need for restoration projects.

Watershed Management Planning

Development of a watershed management plan requires an understanding of the relationship between causes and effects throughout a watershed. Currently there is no "off-the-shelf" method to comprehensively and qualitatively link watershed activities/occurrences to impacts on resources at the watershed scale. Ideally, a plan will identify historic effects of sediment, water, heat, wood and nutrient inputs and define how these are related to natural processes such as hydrology, riparian function and energy transfer (heat and hydrologic) in a watershed. Ultimately, these relationships form the basis of a watershed model which can be used as a predictive decision-making tool.

Watershed management planning is a continuous development and refinement process. There is no perfect plan or model, just an evolving mosaic of wisdom gained from efforts expended over time. Accordingly, we will always face uncertainty in understanding the total affect of new activities in a watershed, whether they be related to land development, stream restoration or species restoration. Irrespective of the uncertainty involved, and as discussed in Chapter 2, ***Understanding What Affects Anadromous Fish***, the following watershed management planning tenets are evident:

Measures to protect and restore anadromous fish and their habitat should:

- be adjusted to correspond to needs which vary during the life cycle of the fish
- nurture and hasten natural processes
- reduce or eliminate negative influences.

In impaired watersheds these tenets apply to all activities, from land development to restoration. From a restoration perspective, it does little good to attempt to restore fishery habitat if the underlying watershed processes are not addressed. Fixing the problem without addressing the root cause typically leads to fixing the problem again or not getting the expected results. Rivers are natural systems; the natural watershed and fluvial processes need to continue as projects are implemented to fix some of the critical sources of habitat degradation.

Each river and each watershed is different. Each has its own set of fishery restoration issues that should be addressed. Local communities are also unique. Local interests have the most to gain from fishery restoration and the most to lose if efforts are unsuccessful or too costly. Clearly, restoration efforts led at the local or regional level offer the most effective means to fully integrate solutions with land use decisions and to avoid problems in the future.

As watershed problems originate from many sources, resources to solve problems need to come from a mix of sources. It is essential for private enterprises and local governments to participate and fund watershed efforts. Similarly, the state and federal governments have a role; anadromous fish are public resources. The keystone of the watershed approach is local leadership and commitment, involvement by all stakeholders and support and guidance from state and federal governments. Through the State's participation in "For Sake of the Salmon," federal funds have been secured for grants to watershed groups to hire coordinators. Eleven such grants were awarded in California in 1997. The State is seeking to double such support in federal funds in the pending budget.

An increasing number of groups are pursuing actions under the watershed approach in California. They include Coordinated Resource Management Planning (CRMPs) efforts, landowner established conservancies, restoration councils and other stakeholder groups. CRMPs, Resource Conservation Districts and counties provide three examples of the watershed approach.

Coordinated Resource Management Planning (CRMP)

CRMP is a problem-solving management process that allows for direct participation of everyone concerned with natural resource management in a given area. The concept underlying CRMP is that coordinating resource management strategies results in improved resource management and minimizes conflicts among land users, landowners, government agencies and interest groups. Using this approach, resource problems are addressed and solved much more effectively because they are based on resource boundaries and not constrained by individual, agency or political boundaries.

The CRMP process operates on the local level but can have broad influence. The philosophy behind CRMP is that those who live, work and recreate on a given piece of land are the people most interested in and capable of developing and implementing plans for its use. Experience has shown that people with diverse viewpoints who voluntarily meet together as a planning team will find common ground as they interact with one another and have a chance to observe resource problems firsthand. Through discussion, landowners, users and resource managers learn to understand and respect each other's viewpoints. Although each member of the group may have different interest in the land, the CRMP process can help them realize they also have a common interest: the continued health and productivity of the land and its resources. The end result is constructive problem-solving through cooperative resource planning.

The CRMP process can be effective in many resource management situations, for example, to bridge gaps among government agencies, private landowners and other resource users. It is particularly appropriate in areas where local resource management issues involve lands under more than one ownership or jurisdiction and where there are existing or potential conflicts among land and resource uses. The process serves to help sustain healthy natural resources. Conservation is dynamic, and requires work to improve resource conditions, including the prevention of degradation, not just fixing problems after the fact. CRMP encourages sharing responsibilities and resources through the cooperative implementation of projects. The CRMP process is often thought of as a way to resolve conflicts over land uses and management. However, its greater strength actually is improving communication and coordinating management activities among diverse interests, even when there is no conflict.

The ultimate goal of CRMP is to protect, improve and maintain natural resources. The objective of each CRMP effort is to develop and implement a unified program of action for resource use and management that minimizes conflict. Actions should be consistent with land and water capabilities and supported by people whose interests are affected.

The local focus of the CRMP process makes community support essential. Community awareness of the constructive, problem-solving nature of the plan strengthens the commitment of those involved in the planning group to make the plan work. In addition, the successful implementation of the CRMP process in an area can stimulate surrounding areas to follow suit, reducing resource conflicts throughout a region.

Resource Conservation Districts

In 1937, the United States Congress passed the Standard State Conservation District Law which encouraged states to form special districts to address growing problems of soil erosion and watershed

management. California responded in 1938 with the addition of Division 9 to the state's Public Resources Code. Division 9 enabled the formation of Soil Conservation Districts (later renamed Resource Conservation Districts (RCDs)) as special districts with limited powers to levy property taxes. Today there are 103 RCDs in California, covering about 85 percent of the total area of the state.

California's RCDs bear a major share of the responsibility for planning and implementing watershed restoration and enhancement projects throughout the state. The efforts of RCDs have been highly successful in providing measurable improvements and advances in flood prevention, wildlife habitat quality, soil protection, water quality and wetlands restoration. These successes have been realized without additional property rights restrictions or regulatory control. Instead, they have been accomplished through educational outreach and grassroots efforts that utilize local experience and strong citizen participation to implement ground-level conservation activities.

Community-Based Watershed Efforts

The California counties within the Transboundary Evolutionary Significant Unit (ESU) (Del Norte, Siskiyou, Trinity, Humboldt and Mendocino) are coordinating and pooling resources to address the issues brought about by the listing of species under the federal Endangered Species Act. Also, the five counties (Mendocino, Sonoma, Marin, San Mateo and Santa Cruz) within the Central Coho ESU held an organizational meeting on Sept. 18, 1997, and agreed to pursue a similar cooperative effort. A follow-up meeting occurred on Oct. 24, 1997, to discuss ways the Transboundary and

Benefits of RCDs

San Diego County RCDs

In 1994 the San Diego County Association of

RCDs conducted a cost-benefit analysis to determine the value to the community of its conservation programs. The analysis of the county's four (through consolidation there are now three) RCDs was conducted over a four-year period.

The four-year, four-RCD total county expenditure for RCD conservation services was \$444,000, for a per district annual average of \$27,000. In turn, this county funding helped to leverage more than \$2,396,000 in conservation funding from state, federal and other local agency sources (an average of \$150,000 per RCD per year). The association calculated that for every county dollar expended on RCD programs, \$5.40 was brought into the county for conservation, including new jobs and economic activity.

Los Angeles County RCDs

In 1991 the two RCDs of Los Angeles County conducted a cost-benefit analysis similar to that of the San Diego County Association of RCDs. The Los Angeles RCDs documented a myriad of direct, environmental and social benefits arising from their conservation programs and services. Placing a dollar value on the environmental and social benefits was beyond the scope of the study. However, the analysis showed that in direct benefits (new outside funds brought into the county for conservation programs, constituent services, information, education and salaries), the RCDs generated more than \$3 million in 1991. This compares with \$192,000 contributed to the RCDs by the county for a return of nearly \$16 for every dollar expended by the county.

Central Coast ESU counties could learn from one another, and how the State and the National Marine Fisheries Service (NMFS), could provide assistance and support. State entities fully participated fully in these meetings. The most recent meeting of this

group was June 4, 1998. The Resources Agency is providing \$50,000 of support. The NMFS plans to provide \$75,000 in support and the counties plan to provide funding and in-kind services of approximately \$84,000.

These counties are in a unique position of vulnerability under the Endangered Species Act (ESA) and the Clean Water Act (CWA). A number of these counties are rural and resource-dependent. Under their authority falls responsibilities including general land use regulation, county and private road maintenance, and instream gravel operations.

Cooperative County Efforts

County governmental leaders have organized two cooperative county efforts for coastal watersheds in the area from the Oregon border to Monterey County. Working in coordination with State and federal officials, county supervisors and their staff have developed and are now implementing formal Work Plans for the protection and restoration of anadromous salmonids. Each of these efforts is briefly described below.

A. The Five-County Effort (Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity Counties): Their adopted Work Plan and formal contract with the Resources Agency provides "...for a comprehensive review and coordination of county level land use regulations and practices as they relate to anadromous salmonid fisheries habitat within the Transboundary Evolutionary Significant Unit watersheds of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity Counties. This effort will: 1) establish a Memorandum of Agreement that will provide for cooperative planning and restoration efforts among the counties; 2) assess the adequacy of existing General Plan policies, Zoning, Subdivision and other land use ordinances; 3) review County management practices that affect Anadromous Salmonid habitat in each county; 4) recommend change to County ordinances and/or practices as necessary; 5) develop a watershed based education/training

program for local agencies and decision makers that will foster better understanding between land use and maintenance practices and salmonid habitat; 6) provide a linkage between this short-term planning effort and long-term efforts, including the Governor's Watershed Protection and Restoration Council planning efforts and watershed based community planning efforts such as CRMPS's.

"This effort will be used to document existing regulation effectiveness and, where appropriate, develop alternative policies, ordinances and practices providing development standards that are suitable to maintain, or enhance anadromous Salmonid habitat. The plan will address the need to target public work projects that enhance fisheries restoration based on benefits within the watersheds, even where such watersheds cross county boundaries.

"This contract effort addresses local land use activities, and is a component of a comprehensive plan that addresses activities identified by the NMFS as contributing to the decline of coho salmon. The purpose of these efforts is to provide regulatory stability for small landowners and local agencies until a state 4D rule or other long-term planning and recovery effort of the state and federal government is accomplished."

B. Fishery Network of Central California Coastal Counties - FishNet 4C (Monterey, Santa Cruz, San Mateo, Marin, Sonoma, Mendocino). In a June 9 transmittal of their Work Plan to the Resources Agency, the spokesperson for this six-county effort noted:

"FishNet 4C is organized to support fishery restoration efforts undertaken by the State's California Watersheds Protection and Restoration Council and those of the National Marine Fisheries Service. The group provides an efficient forum for those agencies to strengthen and monitor local conservation efforts.

"Our goals are to facilitate effective local actions that will maintain or improve our region's water quality and riparian habitat, provide increased assistance and education for local government and the private sector, and encourage cooperation and coordination among all levels of regulatory responsibility for fishery restoration. We seek to accomplish these goals through a process of evaluating existing activities, recommending model programs, tracking legislation, soliciting outside funding, and increasing communications among interested agencies and the public.

"FishNet4C is organized to integrate policy and technical considerations. A Project Management Team (PMT) provides leadership and fiscal oversight. The PMT consists of a member of the Board of Supervisors from each county as well as local government staff with diverse responsibilities. A Work Study Committee (WSC) provides technical support and field experience for the PMT. The WSC is composed of experienced staff from local, State and federal agencies. It is our intention to retain a project coordinator to manage our efforts and staff WSC and PMT."

Statewide Restoration Programs

Department of Food and Agriculture

CalWeed Database

CalWeed is an Internet-based searchable database containing information about noxious weed control projects within the state. The database project began as a subcommittee effort of the California Interagency Noxious Weed Coordinating Committee (CINWCC). Led by staff of the California Department of Food and Agriculture, the inventory of projects has

received additional funding from the Bureau of Land Management's California office. The Committee hopes that the database will serve as a useful tool to agency staff, researchers, biologists, and the public by facilitating the exchange of noxious weed control information. Above all, it should serve as a networking tool for staff with noxious weed control and land management responsibilities.

An agreement with the University of California's Information Center for the Environment (ICE) has allowed CalWeed to reside under the larger umbrella of the Natural Resource Projects Inventory (NRPI), another Internet-based database. The NRPI structure allows the weed control project information to be available through either its own Web site, specific just to weeds, or under a more general Web site which will access project descriptions for all resource management work being reported in California.

CalWeed provides viewers with short reports on various weed control efforts. Information available for a specific project includes:

- project title, purpose, and abstract
- weed targeted for control
- project contact
- cooperators, funders, and landowners
- general location and habitat information
- control methods used

A visitor to the site can view a complete list of CalWeed's projects, or can refine a search by county, targeted weed, or control method. CalWeed currently contains reports on over 350 projects and is continually updated with new arrivals. Projects that qualify for this database attempt to eradicate or reduce the number of noxious weeds in California. The emphasis of CalWeed is on weeds deemed noxious by the California Department of Food and Agriculture or considered a threat to wildlands by the California Exotic Plant Pest Council.

The focus of the database is on projects that target specific weeds for control. These can be weeds that threaten watersheds, which include natural areas, rangelands, open spaces, and agriculture. There is less interest in non-specific vegetation management or biomass abatement.

California Interagency Noxious Weed Coordinating Committee (CINWCC)

CINWCC is comprised of 14 federal, state, and county agencies with land management and/or regulatory responsibility associated with the introduction, spread and impact of noxious weeds. These agencies are signatory to a Memorandum of Understanding (MOU) finalized in 1995. The purpose of the MOU is to provide an agreement to coordinate the management of undesirable plants on federal and state lands. The MOU identifies four objectives required for an effective weed management program, 1) to coordinate management of undesirable plants on public and private lands where such lands are associated together, 2) to promote and implement an integrated weed management approach, 3) to exchange information and awareness and 4) to identify and promote cooperative weed management projects.

In concert with the four objectives of the MOU, CINWCC members, stakeholders, and other associated entities developed a Strategic Plan containing a stated mission and vision, organizational values and special goals for 1998. This will allow the members to better coordinate their noxious weed eradication efforts to protect agricultural lands, as well, as natural resources such as the watersheds that provide habitat for Anadromous fish.

DFG - Regional Programs

North Coast

DFG's focus will be on maintaining and increasing salmonid population abundance with produced stocks. Its management efforts will be directed toward minimizing the impacts from the watershed with principal emphasis on natural disturbances, preventing new disturbances, restoring instream habitat, and increasing summer steelhead populations. Additional grant funds are available for stabilizing upslope and side stream areas so that they will not cause impacts in the channel. DFG also will support education and training projects through the grant process. Staff will provide expertise as requested to watershed groups who are developing and implementing watershed restoration plans.

Greater releases from Iron Gate Dam on the Klamath River are needed. A long-term flow evaluation on the Trinity River was completed in 1996 and may result in increased releases for fish and wildlife. Watershed and stream restoration activities in the South Fork Trinity River need to be accelerated.

Steelhead production in the Scott and Shasta rivers is constrained by severely degraded habitat conditions from timber harvest and agricultural practices. Improved flows for anadromous fish populations in these rivers are needed.

DFG has developed a draft restoration plan for salmon and steelhead in the Eel River which will identify specific actions needed for steelhead restoration in this system. DFG and other agencies are investigating the effectiveness of controlling introduced squawfish populations through techniques such as gill netting and seining, electrofishing, explosives and chemical treatments.

Habitat for naturally-spawning steelhead in the Russian River system is severely degraded. Instream flow requirements for salmon and steelhead need to be determined. When the cumulative impact analysis of existing and proposed diversions is completed, DFG will develop

recommendations for the State Water Resources Control Board (SRWCB) so that necessary instream flows are addressed.

Central Valley

The management focus for the Central Valley steelhead is to recover native and wild populations and restore hatchery-maintained runs.

The Sacramento River below Keswick Dam is beset with many of the ecological problems associated with highly regulated rivers. This river yields 35 percent of California's water supply and provides for the largest portion of the state's sport and commercial salmon catch. These two incongruous functions are at the heart of California's present water controversy. Identified restoration measures for the mainstem include correcting fish passage and fish screening problems at the Glenn-Colusa Irrigation District diversion, Red Bluff Diversion Dam and small agricultural diversions; rerouting the Colusa Drain; and clean-up of Iron Mountain Mine.

Mill, Deer and Antelope creeks have the best potential of all Central Valley streams for restoring wild steelhead populations. These streams are similar in that they have relatively pristine, well-protected upper reaches with ample spawning and rearing habitat, and they suffer from inadequate flows in the lower reaches. A solution to inadequate flows in Mill Creek is being implemented: groundwater is being exchanged for surface flows, with funds provided to the diverter to pay power costs for pumping groundwater. A monitoring program funded by Steelhead Catch Report-Restoration Card revenues was recently implemented in Mill and Deer creeks to assess adult steelhead numbers.

The Yuba River supports the largest, naturally reproducing population of steelhead in the Central Valley. DFG has recommended temperature and flow

regimes to the State Water Resources Control Board (SWRCB) to maintain and restore the anadromous fisheries. DFG will continue to manage the Yuba River as a wild steelhead fishery.

The steelhead population in the American River is almost entirely supported by Nimbus Hatchery. Over the past decade the run has declined significantly, probably due to adverse water temperature conditions, rapid flow fluctuations, inadequate water releases from Nimbus Dam, increased Central Valley Project (CVP) and State Water Project (SWP) exports, and the 1986-92 drought. Measures to restore steelhead populations include: adoption of adequate minimum flows and flow fluctuation standards by the SWRCB; establishment of a minimum storage level for Folsom Reservoir; and correcting the water temperature problem at Nimbus Hatchery.

Natural production of steelhead in the Central Valley will continue to be limited due to the inaccessibility of the headwaters. A hatchery program needs to be implemented if steelhead restoration is to be achieved for the San Joaquin River system.

South Coast

The highest priority for DFG's steelhead management will be on recovering southern steelhead stocks from impending extinction.

Water development has caused severe habitat impacts to the Carmel River, including dewatering, broadening the channel and loss of riparian habitat. A new dam is proposed to increase the water supply in the region. The SWRCB should require identified measures to restore and maintain salmonid populations and should retain jurisdiction over the dam project to ensure that public trust values are protected.

DFG will seek interim and permanent flow regimes from Lake Cachuma on the Santa Ynez River to restore steelhead runs that have been eliminated by water development. The feasibility of providing passage around Bradbury Dam should be investigated.

Constructing a fishway on the Robles Diversion Dam on the mainstem Ventura River would restore access to about 10 miles of spawning and rearing habitat. Discussions should begin with responsible agencies regarding the removal or modification of Matilija Dam to allow access to about 10 additional miles of headwater spawning and rearing areas on Matilija Creek.

Recent construction of a fishway on the Vern Freeman Diversion should restore access to Sespe Creek, the largest and most pristine tributary to the Santa Clara River. Results of fish trapping at the diversion facility in 1994 indicate that a viable steelhead population still exists in the Santa Clara River. Instream flow requirements for steelhead need to be investigated.

The major obstacle to restoring the steelhead run on Malibu Creek is Rindge Dam, located about 2.5 miles upstream from the Pacific Ocean. DFG is currently investigating the feasibility of removing this dam.

DFG - Statewide Programs

DFG, in cooperation with other state agencies, pursues a variety of activities and programs aimed at protecting and restoring salmonids. These actions are generally focused in five interrelated program elements.

- Watershed conservation, protection and restoration, which aims to conserve habitats and ecosystems, rather than focusing on a species-by-species protection approach.

- Fisheries monitoring, research and data management, which uses standardized protocols to collect angler use data, habitat inventories and research results so that these parameters can be of use to the resource management community.
- Fishery management support which includes harvest regulations and hatchery production to replace losses associated with water development projects.
- Regulatory authorities to fulfill legislative intent, current laws and statutes and the policies of the Fish and Game Commission.
- Public awareness and support fostering understanding for the actions needed to protect natural resources and involve local constituencies in decisions that affect their communities.

Project Planning

For every stream that is selected for stream restoration (or enhancement) or improvement based upon the original inventory, a site specific plan is written. Starting at a known point, usually the stream confluence, the stream is surveyed, and at each identified site the following information is recorded: site location in feet from the starting point; present condition of the site; objective of the project; project description; estimated labor to complete the site; materials and supplies needed; and a diagram. Projects include three general categories: instream habitat improvement; fish passage; and watershed and stream bank stability. Descriptions of each of these categories, are included in the *California Salmonid Stream Habitat Restoration Manual*.

Projects are to restore salmon and steelhead habitats that have been lost or degraded as a result of past land use practices. Under Fish and Game Code Chapter 8 Sections 2761 through Sections 2762, and in conjunction with Chapter 8 (commencing with Article 1. Section 6900), the Salmon,

Steelhead Trout and Anadromous Fisheries Program Act, DFG is empowered to administer the Fisheries Habitat Restoration Program. Program projects are planned and carried out by DFG fish habitat improvement personnel during normal DFG habitat restoration activities, or submitted as proposals in response to a request for proposal (RFP), distributed annually by DFG.

A stream inventory report is written for each stream summarizing the habitat and biological inventory described above. From the general recommendations contained in stream reports, a site specific work plan is developed for construction crews. Before any project is implemented, all required environmental review and permits are secured. These include but are not limited to: CEQA; DFG Stream Alteration Agreements, Sections 1600-1607; landowner permission; U.S. Army Corps of Engineers 404 Permit; and California Regional Water Quality Control Board 401 Permit. Site specific work plans will be forwarded to NMFS 30 days prior to commencement.

Fisheries Habitat Restoration Grants

DFG maintains some crews and provides funding through a grant program for various fisheries habitat restoration projects. Fisheries protection is provided by reducing the risk of negative habitat effects from storms, drought and human activities through rebuilding habitat and habitat manipulation. Funding is provided through various account sources managed by DFG, such as Commercial Salmon Stamp, Steelhead Catch-Restoration Card, Salmon and Steelhead Restoration, and accounts managed by the Wildlife Conservation Board. Grants can be made for the following:

- Instream habitat restoration.
- Watershed and riparian habitat restoration.
- Watershed evaluation, assessment, and planning, including multi-year grants for watershed planning.

- Project maintenance and monitoring following project implementation.
- Watershed organization support and assistance.
- Private sector technical training and education projects.
- California Forest Incentive Program (CFIP) projects meeting CFIP guidelines.
- Cooperative fish rearing with private sector.
- Public education, including watershed and fishery conservation education projects.

As part of this program, DFG conducts habitat quality evaluations and maintains data on habitat quality and restoration projects. About \$2 million to \$3 million is available annually. DFG issues annual RFPs in February and grant applications are due in early April. Anybody may apply for these grants.

Coastal Watershed Restoration Program

Legislation (SB 271) was passed and signed by the governor in 1997 that earmarks \$43 million over six years (\$3 million in FY 1997-98 and \$8 million for each of the next five years) for anadromous fisheries habitat restoration and watershed planning efforts. Over the next few months, DFG will develop a coastal watershed restoration program startup plan for this effort. It calls for the coordinated efforts of not only DFG staff but also all state agencies that have programs that protect or help to restore anadromous fish habitat. Key elements of this developing plan include:

- Establishing statewide and watershed-specific **recovery goals**.
- Developing **measurable targets** to assess fishery and watershed recovery.
- Developing watershed assessment plans and **implementation plans** to accomplish goals.
- Establishing a **clearinghouse** to review restoration contract and grant proposals from all funding sources to avoid project duplication and to focus activities into high priority areas
- Developing a coast-wide **watershed planning interface with local watershed groups**, city and county agencies, state agencies and tribal governments.
- Establishing an **integrated technical information system** to collect fish and habitat information for **baseline conditions and trend analysis**.
- Developing an **adaptive management** ethic for all restoration activities.

Sustained Yield Plans for Forest Landowners

The Board of Forestry (BOF) requires landowners over 50,000 acres to develop a plan that demonstrates the continual flow of high quality forest products to the mill. DFG supplies support to CDF for technical analysis whenever the landowner wishes to incorporate protection measures for endangered species or candidates such as anadromous fish. Presently, all large coastal landowners are developing plans that include protective measures, watershed analysis and monitoring for their timber operations. Completion of these plans for most large landowners is anticipated soon.

Coho Salmon Restoration Planning

Designation of coho salmon as endangered south of San Francisco by the California Fish and Game Commission led to an earlier restoration planning effort. A team was appointed and is examining actions affecting coho, the extent of restoration activities, and the need and priority for additional actions. This watershed planning effort will be expanded to areas north of San Francisco as a result of the federal listing.

Steelhead Restoration Plan

In February 1996, DFG published a plan for the restoration and protection of steelhead, (see Appendix C) with the highest priority given to southern populations. This comprehensive review of areas which need attention will be used by DFG to focus restoration actions and coordinate project development with local entities. An example of this strategy is construction of a fishway at Harvey Dam on Santa Paula Creek in Ventura County. The city of Santa Paula is providing operational data, DFG is doing the engineering, and a private construction firm was hired to do the work using Proposition 70 funds. Completion was scheduled for the fall of 1997, but construction has not yet started. Similar actions throughout the state will be implemented as funds become available.

Eel River Basin Planning

DFG has initiated a habitat inventory and fishery restoration program within the Eel River Basin. To date, over 200 streams have been surveyed, habitat problems identified, and reports recommending actions produced. A significant part of this effort has involved information gathering and discussion in the community. Workshops were held to elicit the views of the local constituencies, as well as the scientific and resource use communities. DFG will continue to expand these efforts, completing the Eel River Action Plan that will guide restoration throughout the area.

Russian River Basin Planing

Habitat inventory of about one-third of the Russian River Basin is complete, focused on streams important to coho salmon. DFG will continue this work and support local watershed restoration groups, as well as larger efforts that are addressing the mainstem Russian River to protect aquatic

resources, such as the work of the Coastal Conservancy.

Migration Barrier Removal

The state will continue to coordinate habitat improvement and barrier removal programs through DFG, using local contractors and the California Conservation Corps. Opportunities for habitat improvements such as correction of passage at many small dams and improperly placed culverts still exist, even after an aggressive program over the last 10 years to find and remove these types of barriers.

Unscreened Diversions Program

The state's program to identify unscreened water diversions detrimental to juvenile salmon and steelhead has been mainly focused in the Central Valley and Sacramento-San Joaquin Delta, where large agricultural diversions are common. It is planned to expand this program to coastal areas, so that diversions needing screens can be identified on a priority basis.

Instream Flow Studies

The state (usually DFG) conducts instream flow studies to determine the minimum flow necessary for the maintenance of fish populations. These studies are conducted by teams for agencies interested in water appropriations through dams and wells. Several coastal streams have been studied and reports published. Presently, Central Valley streams are under study.

Sensitive Species and Habitat Mapping Project

DFG is mapping (through GIS and other techniques) important sensitive species, rare habitats, natural plant communities, and riparian and associated habitat areas along north coast and inland areas to increase the

effectiveness of its project analysis. This information is becoming available over the Internet via the California Environmental Resources Evaluation System (CERES) program.

Timber Tax Credit Program

A statute was enacted in 1994 that taxed softwood exports, producing a fund that allows landowners accomplishing certain fishery restoration projects to claim a credit of up to 10 percent of the cost of doing this work. DFG administers and reviews the applicability of the projects prior to approval of the tax credit by the Franchise Tax Board. This program will facilitate many projects throughout coho salmon and steelhead drainages.

Fish Tax

The Fish-related Incentives for Sustainable Habitat-Timber Tax Credit Program (known as the FISH Tax) was created by AB 2925 (Sher; Ch 1296, 1994) in a collaborative effort between the state of California and private landowners. This law was amended by SB 846 (Thompson; Ch 166, 1996) to streamline and codify key aspects of the program. This program provides a tax credit to individuals and entities conducting approved habitat restoration work on their land which is beneficial to salmon or steelhead and encourages private landowners to hire displaced workers from the commercial fishing or forest products industry to conduct some of the work.

DFG administers the program, approves individual projects and issues certificates for tax credit. Landowners are required to complete a short application form and attach a project description. Each project application is reviewed for compliance with the law. A field review is conducted for projects meeting those requirements. Projects meeting requirements are then approved for tax credit. When project work is completed, a final inspection will be conducted to determine whether the

applicant completed the work as proposed. A certificate for tax credit is then issued. There are no fees associated with any part of the program.

The amount of tax credit for approved projects is up to 10 percent of the total qualified project costs. The credit is applied to the "net tax" of the taxpayer or partnership requesting the credit as listed on the application form. Total qualified project costs include labor, equipment and materials. Some types of "in-kind" services may also be included as part of total project cost (e.g., hire unemployed timber workers for labor but the landowner operates heavy equipment to move rocks or soil, or to transport willow cuttings; equipment time can be charged at prevailing rates). Qualifying costs also can include those paid or incurred as part of a cost-share project that has been approved by DFG or other public agency and are for work that will provide benefit to salmon or steelhead. The maximum amount of tax credit available to any taxpayer or entity is \$50,000 per year. The tax credit must be claimed in the tax year in which approved expenses were paid or incurred. If the applicants tax credit exceeds the net tax in that tax year, the difference can be carried over into succeeding tax years until the credit is exhausted.

This program is funded almost entirely by a tax placed on timber harvested in California which is sold outside the United States as unprocessed logs or cants. This tax creates a tax credit fund of approximately \$500,000 per year. By law, DFG cannot issue tax credit exceeding this amount. Presently, DFG's Non-dedicated Preservation Fund pays for administration of the program.

Public Awareness and Support

Many of the state's salmon restoration programs require a high level of public awareness and support. DFG, CDF, SWRCB and the North Coast Regional Water Quality Control Board co-sponsor a "watershed training academy" for agency

staff, RPFs and watershed coordinators who conduct projects, advise landowners or approve permits. The academy was established in 1996 and 100 graduates are anticipated. The academy will be expanded to include landowners and local groups as funding becomes available. In 1997, co-sponsors included NMFS. Course content covers the technical aspects of:

- Salmonid life history and instream beneficial uses.
- Watershed assessment and evaluation of cumulative effects (manuals are supplied).
- Recognition of potential impacts and high risk areas.
- Hillslopes, roads, stream crossings, streamside zones and fish barriers.
- Mitigation, protection and restoration methods.
- Monitoring theory and methods.

California Fish and Game Advisory Commissions

Under the California Fish and Game Code (Section 13003), one-half of all fines collected for violations of the code are sent to the county in which the offense was committed. These funds are to be used for the protection and improvement of fish and wildlife resources or education regarding these resources in that county. Every county must have some mechanism to disperse the funds. Most counties have Fish and Game Advisory Commissions that are responsible for distributing these funds. The amounts available vary from county to county and from year to year.

For example, the Santa Cruz County Fish and Game Advisory Commission, which considers applications for grants supported by fine money, collects an average annual amount of about \$25,000. The commission provides up to \$3,000 in grants for projects that involve habitat improvement, research, education, wildlife management, rehabilitation and law enforcement. Past

projects included fisheries assessment and habitat support of a local fish hatchery, funding for Native Animal Rescue, slough restoration and educational material for schools. The Santa Cruz Commission grants are awarded to individuals, institutions, nonprofits and agencies, and the funding cycles around February of each year.

Department of Water Resources

Urban Streams Restoration Program

The Urban Streams Restoration Program (USRP) was established by DWR to address flooding and erosion on urban streams using environmentally sensitive methods. It provides grants for projects that clean-up streams, stabilize banks and improve riparian habitat in urban areas. Project benefits often include reduced bank erosion (and reduced sedimentation downstream), increased canopy cover (providing food sources and reducing water temperatures), improved water quality (by riparian filtration and removal of junk) and improved summer flows (by recontouring low flow channels).

The USRP has provided approximately \$4.5 million in grants to over 160 small projects since 1988. Some projects have specifically included measures to improve habitat for anadromous fisheries. For example, the Redwood Community Action Agency and the city of Arcata has received \$94,000 in grants for work on Jolly Giant Creek in Humboldt County. This project included opening several culverted sections of the creek, removing illegal fill and creating a wetland pond. This pond also functions as a sediment detention basin, restoring riparian vegetation, adding spawning gravel and

woody debris and reestablishing the connection between the creek and the floodplain for better function during high flows.

The USRP is currently providing a grant of \$185,000 to the Sotoyome-Santa Rosa RCD and Circuit Rider Productions, Inc., for work on the Russian River Watershed. The flooding and erosion problems on the Russian River are a result of many activities in the watershed. The project will include: development of a guidance document to explain physical and biological processes in the river and tributary creeks and the effects of certain land use practices on the system, and provide non-structural measures for flood hazards reduction and creek restoration and management, involvement of the public and volunteer stewards in watershed enhancement and monitoring, and implementation of a demonstration project on Brush Creek in Santa Rosa which will improve conditions for fisheries. While this project is primarily focused on reducing erosion and flooding, it also has significant potential benefits for water quality and anadromous fisheries in the watershed.

The USRP also provides information and technical assistance to local agencies and community groups regarding options for management and restoration of urban streams and has local agency and citizen contacts throughout the state.

Gravel Restoration Projects

In cooperation with DFG, DWR-Northern District has carried out major salmon spawning gravel restoration projects on the Trinity, Klamath, Shasta, San Joaquin and Sacramento rivers. These projects varied considerably in size and funding. The largest project was funded through the Delta Pumps Fish Protection Agreement. It placed about 100,000 cubic yards of spawning gravel at eight sites on the Upper Sacramento River between Keswick Dam and Clear Creek in 1990-91 at a cost of \$2,162,000. The other projects were much

smaller, usually costing \$250,000 to \$500,000. These projects were intended to restore salmon spawning gravel below dams, which have caused gradual degradation of the spawning areas. The dams block stream gravel that naturally migrate down the streams and lower peak flows that reduce stream bank erosion. Gravel mining, bank protection and levee construction have also contributed to the problem.

Instream Flow Needs Studies

In 1977, DWR staff carried out a study of flow needs for salmon and steelhead in the Trinity River funded by the U.S. Bureau of Reclamation (USBR) using an early version of the Instream Flow Incremental Methodology (IFIM). DWR staff also assisted the USFWS with a more sophisticated study of the Trinity River in the 1980s. In the early 1990s, DWR-Northern District staff conducted a much larger study of instream flow needs on the Upper Sacramento River funded by DFG and DWR. These studies were intended to define flow needs for the different life stages of salmon and steelhead in these rivers so flow release schedules from the major dams could be modified to provide the best conditions for fish consistent with other needs.

Fish Ladder and Fish Screens

DWR staff has worked on a series of contracts with the Wildlife Conservation Board (WCB), DFG, USFWS and USBR to provide technical and engineering services for surveying, design, inspection, and environmental, geological and other services related to constructing stream restoration projects on the Sacramento River and its tributaries. The projects typically include reconnaissance, feasibility evaluation, design, construction, or inspection work on fish ladders, fish screens, removal of barriers, habitat restoration or other related work. The Central Valley Project Improvement Act (PL 102-575) and the CALFED Bay-Delta Program have provided funding for a large number of such fishery

restoration projects in northern and central California.

Land Use and Land Classification Surveys

Since about 1950, DWR has conducted land use and land classification surveys to determine current and potential water needs. The cycle of surveys had been about once every five to six years for areas of major development. For example, Shasta County was last surveyed in 1990 and was updated in 1995.

DWR staff participates in preparing and implementing CRMPs in many locations though out the state. DWR staff typically provides technical expertise and data for these efforts. The Northern District has provided assistance and expertise in GIS mapping to local groups developing watershed management plans. Maps were produced for the Mill Creek Watershed Conservancy to document existing conditions in the watershed, and a similar effort on the Deer Creek watershed will begin this year. Work also has been done for the Upper Sacramento River Fisheries and Riparian Habitat Advisory Council (SB 1086) and its Riparian Habitat Committee. Technical assistance has been provided to this group for nearly eight years, including creation of an extensive Sacramento River GIS.

In conjunction with the Sacramento River Watershed Management Program, the MWQI Program developed a comprehensive compilation of watershed management programs and other monitoring programs in the Delta and its tributaries. This compilation was developed to facilitate coordination of efforts, data and information among all watershed management and monitoring programs in the region. Coordination

between all programs will enable stakeholders to develop more efficient approaches to watershed protection and restoration, and balanced solutions to water quality problems which address all beneficial uses.

A compendium of water quality investigations in the Sacramento-San Joaquin Delta was published in 1993. This compendium is being updated and expanded to include watershed management and other monitoring programs within the Sacramento River watershed. Following this update, the compendium will be further updated to include all programs within the San Joaquin River watershed.

California State Coastal Conservancy

The Coastal Conservancy is one of the few agencies that provides grants to conduct watershed planning in coastal watersheds. The conservancy draws funds from various state bond acts (Propositions 18, 19, 70) and must comply with the specific authorities of each act. Under its Watershed Enhancement Program, the conservancy can provide a maximum of \$100,000 for plan preparation. Once a plan has been completed, additional funds may be available for implementing plan recommendations. A local match of 25-30 percent of the total project cost is normally required; this match can be in hard funds or in-kind services.

Unlike most agencies, the conservancy has no formal application forms for proposal submittal. Proposals are reviewed year round. Selection criteria include the significance of the downstream resource and need for watershed enhancement; a greater than local concern for the area; the urgency and cost-effectiveness of the project; evidence of strong cooperation and support of local government and private landowner provision for monitoring and long-term maintenance of the project; and the ability of the site to serve as a model project.

Department of Education

Environmental Education Grant Program

The California Department of Education (CDE) works with the Resources Agency and Cal-EPA to promote educational opportunities relating to energy conservation, environmental protection, pollution effect and the use of natural resources. The purpose of the Environmental Education Grant Program (EEGP) is to assist kindergarten to twelfth grade students and teachers in achieving "environmental literacy" to understand fundamental ecological concepts, and to facilitate responsible action toward the environment.

EEGP provides four categories of comprehensive grants: mini-grants (up to \$3,000), and implementation, site/facilities and networking grants (up to \$15,000). The department's Science and Environmental Education Unit coordinates the allocation of grant funds to schools and nonprofit agencies. Applicants must show proof of commitment through matching contributions and submit a proposal that convinces the Grant Review Committee and CDE that the project will continue to benefit the target audience after the state funds have been spent.

- 1) Mini-grants: Grants for projects that implement environmental education programs and those that promote responsible action projects such as the Adopt-A-Species Project Life Lab, Adopt-A-Stream, Adopt-A-Beach and projects that monitor the environment.
- 2) Implementation grants: Grants for projects that adapt existing curricula to a local situation. The project must benefit a large percentage of students in multiple schools or in a district-wide or regional setting. An example is the Adopt-A-Watershed Program.

- 3) Site/facilities grants: Grants for the development of a local site or facility that will result in more effective environmental instruction for students or faculty in the school. Examples include construction of a nature center or interpretive trail.
- 4) Networking grants: Grants for projects that encourage networking between schools and other agencies, districts and existing state and national networks. An example is the opportunity to develop a cohesive group with mutual goals and shared focus such as participation on a CRMP or watershed advisory group.

California Department of Forestry and Fire Protection (CDF)

Urban Forestry Grant Program

The Urban Forestry Grant Program was created by the California Wildlife, Coast Land Conservation Bond Act of 1988 (Proposition 70). The bond measure allocated \$5 million to be administered over a five to seven year period beginning in 1989. Approximately \$633,000 was available annually for grants. Fiscal year 1998-1999 is the final year of this program, with approximately \$400,000 available.

Cities, counties, districts and nonprofit organizations may apply for grants. Eligible activities include planting trees along streets, in dedicated open space area and in public parking lots and school yards. The maximum grant request is \$30,000 per project, and 90 percent of the funds must be used for purchasing trees. The remaining 10 percent can be used for public awareness and education that will encourage community participation, stewardship and additional community tree planting.

SB2 in the 1998 legislative session could authorize another \$10,000,000 for this program.

Forest Stewardship Program

The Forest Stewardship Program is supported by funds from the U.S. Forest Service's Local Assistance Program. The program provides grants to develop forest "stewardship" plans. In addition to improving forest resources and addressing fire safety, the purpose of stewardship plans is to identify resources, such as wildlife, fisheries and threatened and endangered species for improved management. Recently, the focus of the program has changed from individual landowners to assisting the development of community-based watershed plans.

Local government agencies, special districts such as RCDs, and nonprofit organizations are eligible for grants. The area addressed by the proposal must be wildland outside of the urban zone. Oak woodlands and coastal scrub along with traditional forest types are eligible areas.

Approximately \$15,000 is available per grant. No match is required, but those projects with local matching funds are treated more favorably in the selection process.

California Forest Improvement Program (CFIP)

The purpose of CFIP is to encourage private and public investments in and management of forest lands and resources to ensure protection of all forest resources while providing for adequate future high quality timber supplies, related employment and other economic benefits. The main emphasis is the small landowner with less than 5,000 acres of timberland. During the fourteen years of CFIP funding, over 200,000 acres of forest land were reforested. The department is authorized to

cost-share up to 90% of a forest improvement project. Over one million acres were included in forest stewardship management plans. A 1986 study of the economic benefits of the CFIP program indicated that over \$50 in economic activity is created for every state dollar spent for CFIP in rural areas.

California Department of Parks and Recreation

Land and Water Conservation Fund Program

A federal grant from the National Park Service funds the Land and Water Conservation Fund Program to assist in the acquisition or development of neighborhood, community or regional parks or facilities supporting outdoor recreation activities.

Eligible applicants include counties, cities, recreation and park districts, and special districts with public park and recreation areas. The program requires a 50/50 match. The applicant is expected to finance the entire project and will be reimbursed for half of the costs up to the amount of the grant.

Habitat Conservation Fund

Funding for a variety of habitat conservation projects is provided by the Habitat Conservation Fund. Eligible applicants include counties, cities and districts. Eligible projects are those that protect or enhance deer or mountain lion habitat, including oak woodlands; habitat for rare and endangered, threatened and fully protected species; wildlife corridors and urban trails wetlands; aquatic habitat for spawning and rearing of anadromous salmonids and trout species; and riparian areas.

The program has \$2 million available annually and requires a 50 percent match from a non-state agency source.

Environmental Enhancement and Mitigation Program Grants

Environmental Enhancement and Mitigation Program Grants provide funding for projects that mitigate eligible transportation facilities. The state Legislature established the program in 1989 (Section 164.56 of the Streets and Highways Code) and allocated \$10 million annually for 10 years beginning in fiscal year 1991-92, through fiscal year 2000-01.

Any local, state or federal agency or nonprofit entity may apply for these grants. The applicant does not have to be a transportation or highway related organization, but must be able to demonstrate adequate capability and enabling authority to carry out the type of projects proposed. Projects may be sponsored by two or more proponents.

Eligible projects include highway landscaping and urban forestry; acquisition, restoration or enhancement of resource lands; and acquisition and/or development of roadside recreational opportunities, including trails and trail heads. The general limit for individual projects is \$250,000 but under unusual circumstances additional funds may be awarded.

California Conservation Corps

The California Conservation Corps (CCC) has done an extensive amount of salmon and steelhead restoration and enhancement work over the last 20 years. In fiscal year 1996-97 the CCC performed an estimated \$3.3 million of reimbursement work for DFG, USFWS, the Wildlife Conservation Board,

Americorps and numerous local fisheries management agencies. During that time, the CCC worked approximately 251,000 hours on stream restoration and enhancement projects, primarily in Mendocino, Humboldt, Trinity and Del Norte counties.

In the 1997-98 fiscal year the CCC expects to extend the current contracts of \$3.3 million as well as up to an additional \$1.7 million from the Federal Emergency Management Agency. In addition, funding from the recently passed Proposition 204 may provide the CCC with additional fisheries projects. In the 1997-98 fiscal year, CCC estimates that it will receive approximately \$5.0 million for fisheries restoration work that will require the department to work about 450,000 hours.

State Water Resources Control Board

The SWRCB administers funds for watershed management planning and implementation projects that reduce, eliminate or prevent water pollution and enhance water quality. Specifically, federal funds are available for water quality planning and assessment (CWA Section 205[j]) and nonpoint source implementation programs (CWA Section 319[h]), and state funds are available through Proposition 204 (Agricultural Drainage Management Construction Loans and Delta Tributary Watershed Grants).

205(J) Program

Annually, the anticipated funding level in the 205(j) Program ranges between \$400,000 to \$750,000. Eligible activities include development of watershed plans or other planning functions designed to resolve actual or potential water quality issues. Proponents must show that a coordinated approach with relevant agencies and stakeholders will be employed. Only local public agencies are eligible; state agencies are not eligible for grant funding.

Grants must be matched with at least 25 percent non-federal funds.

319(H) Program

The anticipated funding level in the 319(h) Program is approximately \$2.5 million annually. Eligible activities include the implementation of BMPs for agricultural drainage, acid mine drainage, physical habitat alteration, channel stabilization, sediment control, hydrologic modification, dredging silvicultural practices, livestock grazing, confined animal facilities management and others. Technology transfer, pollution prevention, citizen monitoring and educational elements of projects are eligible. Nonprofit organizations, government agencies and educational institutions are eligible. Grants must be matched with at least 40 percent non-federal funds.

Proposition 204 Funds

Proposition 204 provides up to \$27.5 million in loans and up to \$2.5 million in grants for drainage water management units (works or facilities). Any political subdivision of the state involved with water management is eligible.

Proposition 204 also provided \$14.5 million for one-time grants to address restoration projects in watersheds tributary to the Delta or Trinity River. Eligible applicants include counties in these watersheds, joint power authorities with those counties and, in specified cases, local public agencies.

Private Foundations and Grants

More and more private foundations and corporations are adding environmental areas to the list of causes they support. Listing specific private grant sources, each with its own requirements, would be beyond the

scope of this document. The Foundation Center Library in San Francisco and the Nonprofit Resource Center in Sacramento are good sources of information.

Voluntary Restoration Programs

Stream and watershed restoration programs must have the cooperation, and preferably the active participation of local landowners. In many of the coastal watersheds of California the land is privately held, sometimes by large forestry-related companies and often by smaller companies or individuals. Federal land holdings (in the form of national forests) in Del Norte, Trinity, northern Humboldt and Santa Barbara counties are significant.

Many landowners are effective stewards of their land and the streams that traverse them. Similarly, local water agencies along the coast recognize that stewardship of their watersheds is necessary for the protection of their water resources. Where these water agencies exist public awareness of the water and biological resources in the area is high and programs are already in place to protect these resources. The next section presents information related to local efforts in watershed restoration.

Restoration Activities by Watershed

General Statewide Inventories

DFG Data Co-op

The California Department of Fish and Game's Coastal Watershed Restoration

Program has initiated a consolidated approach among data holders and users for the management of data relating to California's coastal salmonid populations. The Group has adopted the following mission statement:

The Mission of the Coastal Salmonid Watershed Data Cooperative (Data Co-op) is to establish an open forum of data exchange to promote the conservation and restoration of salmonid populations and their watersheds through the maintenance of data used to determine the status and trends of these resources.

The Data Co-op holds quarterly meetings, with smaller working groups conducting specific tasks between the general meetings. Five working groups with chairpersons have been established to work on the following action items: 1) data acceptance criteria, verification needs, and public release policy, 2) survey of existing databases and database holders, 3) identify assessment questions which will drive the databases, 4) determine the potential and feasibility of establishing and maintaining an electronic library of past reports and documents, 5) survey and compilation of existing and proposed sampling protocols. Among the data which would be appropriate to be maintained by the Data Coop are: historical, monitoring and privately collected data, observations and trend data used in preparation of Section 10 Applications under the Federal Endangered Species Act, and data collected during activities conducted under Section 10 Permits; data used or collected pursuant to habitat restoration projects funded by the newly created Salmon and Steelhead Trout Restoration Account (SB 271), and other State regulated funding sources providing for watershed restoration projects. Linkages will also be established with databases maintained by the Department's Natural Heritage Division, and Regional offices and other public and private databases.

Inventories of watershed restoration activities and projects are available through

at least three Internet Web sites and a database maintained by DFG:

Watershed Information Technical System (WITS):

<http://ceres.ca.gov/watershed/>): The goal of this internet web site is to provide information and tools to support local watershed planning, restoration, monitoring and education. WITS can be accessed through the Resources Agency home page at <http://www.ceres.ca.gov>. The information included on the WITS web page follows:

- Pilot Watersheds:
Mendocino Coast
Russian River
Sacramento River
- Access to information related to the following themes:
Watershed Planning
Assessment and Monitoring
Restoration
Networking - Points of Contact

Regulatory, Legal, and Permitting
Education and Training Opportunities
Funding

California Ecological Restoration Projects Inventory (CERPI):

<http://ice.ucdavis.edu/> CERPI): This internet web site provides an inventory and review of over 300 conservation and restoration projects. It is a project by the Society for Ecological Restoration, California Department of Conservation, University of California at Davis and U.S. EPA. This web site provides access to a database that displays information related to the type of ecosystem restored, project goals, performance standards, reference to monitoring data, specific techniques used, publications, contact names and addresses and additional information for each project. These projects are listed alphabetically, by county or by habitat type (see Appendix D for a list of the projects that can be

reviewed on line). The site also encourages others to submit a data entry form to allow others to view details of specific projects on line.

California Watershed Project Inventory

(<http://endeavor.des.ucdavis.edu/wpi>):

This internet web site contains an inventory similar to the CERPI, but for about 300 watershed projects. Contributors to the data include DFG, SWRCB, U.S. Bureau of Land Management (BLM), California Department of Forest and Fire Protection (CDF) and the California Biodiversity Council. Two-thirds of the data is retrievable through GIS (see Appendix E for maps and listings of projects in the coastal watersheds and a sample of the way the data in this inventory can be displayed).

Fishery Habitat Restoration Grants:

DFG maintains a database of Fishery Habitat Restoration Grant Programs for anadromous fish within California's coastal watersheds (see Appendix F for a summary of some of the data for the projects in this database). Restoration projects and the total dollars spent from 1981 to present are listed.. Projects under this grant program include: instream structures designed to produce pools and complex cover, bank stabilization using both woody material and rock, barrier modification spawning gravel collection devices, fish screens and streamside rearing projects. Projects in the Sacramento and San Joaquin watersheds are not included.

Habitat Inventory Data Base: DFG also maintains the California Habitat Inventory Data Base (see Appendix G). The primary purpose of performing habitat inventories is to assess the condition of a stream for potential restoration. The data base converts to maps which show the streams in the coho habitat range where stream habitat inventories have been conducted by DFG over the past five years. This type of data provides a basis for understanding the physical characteristics of instream habitat.

Natural Resources Project Inventory

(<http://endeavor.des.ucdavis.edu/nrpi/>):

NRPI produces information available both as a written report and as an electronic database searchable on the Internet. NRPI is an expansion of previous inventories such as 1) the California Watershed Projects Inventory (CWPI), supported by the US Environmental Protection Agency (USEPA), the State Water Resources Control Board and the California Resources Agency, and 2) the California Ecological Restoration Projects Inventory (CERPI), supported by the USEPA, the Society for Ecological Restoration and California Department of Conservation. To date, over 1500 natural resource projects have been cataloged in the State.

Water Quality Restoration Activities By Watershed

The following is a brief description of those coastal watersheds especially affected by the Endangered Species Act listing of the coho salmon and steelhead fisheries as threatened. The description provides, from a water quality perspective, a list of the problems these watersheds face, the efforts underway to address the problems and the many public and private organizations and groups who are dedicated to finding resolution to the problems.

North Coast Region

Russian-Bodega Bay Watershed

The Russian River-Bodega Bay Watershed encompasses 1,485 square miles of drainage area in Mendocino and Sonoma counties bounded by the Coast Ranges. The mainstem is about 110 miles long,

flowing southward from Redwood and Potter valleys (north of Ukiah) to its confluence with Mark West Creek, where it turns west to cut through the coast range and empty into the Pacific Ocean at Jenner.

The Bodega Unit is typified by cooler temperatures and relatively high rainfall due to coastal influences. The terrain is relatively steep, the streams carving through the Coast Range and entering the Pacific Ocean south of the Russian River. Salmon, Americano and Stemple creeks and their associated estuaries are the main waterbodies. They are located in erosive topography and are sensitive to land disturbance. Summer flows are often restricted to isolated areas.

The three major watersheds in this unit each have estuary areas, most notably those associated with Americano and Stemple creeks, the Estero Americano and Estero de San Antonio. These estuaries are prized for their resemblance to fjords and the resource values associated with isolated estuarine areas.

Issues-Problems

- Storm water runoff from agricultural, urban, industrial and construction sites.
- Tertiary wastewater treatment levels are needed at all nine urban areas in this watershed; currently only three use tertiary treatment.
- High septic system failure rate at various western Sonoma County areas.
- Unpermitted discharges.
- Erosion potential from vineyards.
- Bacterial objectives for contact recreation is not always met at some swimming beaches
- USGS sediment data for the Russian River is not evaluated as to erosion and sedimentation issues and the anadromous fishery.
- Confined animal facilities contribute nitrogen, phosphorus, organic matter and sediment loads to watershed.
- Pesticide and fertilizer use in orchards, vineyards, turf farms and urban areas are a concern.

- Mercury accumulation in fish tissue in lakes Pillsbury, Mendocino and Sonoma are approaching California Department of Health Services (DHS) warning levels for fish consumption.
- Abandoned mercury mines in Big Sulphur and Fife Creek drainages.

Efforts to Address Problems

- Inspections of permitted dischargers.
- Inspection of storm water permittees on a risk basis.
- Permits/enforcement of advanced wastewater treatment for all seven Russian River municipal dischargers.
- Implementation and enforcement of Best Management Practices (BMPs) for nonpoint source discharges through grant-funded projects, volunteer monitoring coordination, public education and outreach.
- Coordination with local agencies and groups to secure past and present studies.
- Maintenance of effective individual waste disposal systems program described in the Regional Board Basin Plan.
- Establishment of long-term monitoring stations to provide data for Russian River mainstem.
- Establishment of focus groups to address specific water quality issues.

Maintenance of a database of projects and actions by coordinating efforts with DFG, CDF and Cooperative Extension.

Local Organizations Involved

- Native American Pomo Basket Weavers
- Green Valley Creek Watershed Advisory Group
- Laguna Foundation
- Laguna Coordinated Resource Management and Planning Task Force
- United Dairywomen
- United Winegrowers
- Russian River Watershed Protection Committee
- Friends of the Russian River
- Russian River Alliance
- Vernal Pool Task Force

- Trout Unlimited
- Salmon Unlimited
- Citizens for Cloverdale
- Committee for Sensible Reuse
- Surfrider Foundation

Klamath River Watershed

While the Klamath River Watershed will be divided into three subbasins – lower, middle and upper – for budgeting purposes, the following listing of issues, efforts and agencies is a watershed-wide discussion.

The Lower Klamath is 2,564 square miles, encompassing that part of the river and tributaries downstream from the Scott River to the Pacific Ocean (except the Trinity River). Included in this portion are the Salmon River and the Klamath River delta-estuary. This is largely rugged forest land with highly erodible soils. Population is small and scattered. The most significant problems are related to forestry practices.

The Middle Klamath is 2,850 square miles encompassing that part of the Klamath River and tributaries downstream from the Oregon border to the confluence of the Klamath and Scott rivers. The two major tributaries, the Shasta and Scott rivers, receive localized precipitation as well as snow and glacial melt from nearby mountains.

The Upper Klamath includes Lost River drainage, Upper Klamath Lake and the tributaries in Oregon. The primary watershed in the Upper Klamath in California is the Lost River watershed, 1,689 square miles encompassing Clear Lake Reservoir, Tule Lake-sump and Lower Klamath Lake. The Lost River Basin is closed with no natural outlet. Former wetlands are now intensively managed for wildlife with cropping and wildlife uses mingled and overlapping, creating concerns about the viability of potentially competing uses.

Issues-Problems

- Agricultural water uses and silvicultural activities.
- Impacts of mine drainage, industrial sites and the Yreka wastewater

treatment plant on surface and groundwater.

- The Klamath River in California is on the CWA Section 303(d) list for excessive nutrients and high water temperature.
- Anadromous salmon and steelhead in the Klamath Basin is in decline due to many land use activities.
- Steelhead is listed as threatened for entire Klamath Mountains Province.
- Coho salmon is listed as threatened.
- Chlorinated solvents found in Yreka Creek, cause unknown.

Efforts to Address Problems

- Inspections of permitted dischargers to verify compliance.
- Inspection of storm water permittees on a risk basis.
- Continued timber-related oversight activities.
- Maintain effective individual waste disposal systems program.
- Continue with interagency coordination and assistance to resolve water quality problems.
- Participate in, and support, Klamath River Compact Commission's proposal for integrated water management plan for Klamath Basin.
- Satisfy CWA 303(d) requirements to reduce nutrient, temperature and oxygen demand loadings.

Local Organizations Involved

- Native American Tribes: Klamath, Hoopa, Yurok, Karuk
- Lava Beds, Siskiyou and Shasta Resource Conservation Districts
- Tule Lake, Klamath, Butte Valley and Montague Irrigation Districts
- PacifiCorp
- Klamath Water Users Association
- Klamath Forest Alliance
- Scott CRMP
- Shasta CRMP
- French Creek Watershed Advisory Group (WAG)

Garcia River Watershed

The Garcia River drains a 114-mile watershed in the northern Coastal Range in southwestern Mendocino County. The river flows northwest along the San Andreas Fault Zone for part of its course and then west to the Pacific Ocean at the Point Arena Lighthouse. The Garcia River forms an estuary, which extends from the ocean to the confluence of Hathaway Creek. Land use activities in the watershed include timber harvesting, grazing, gravel extraction and agriculture. Significant floods also impact the geomorphic, sediment transport, and biologic characteristics of the river.

Issues-Problems

-
- Anadromous fishery is in severe decline. Multiple land uses may be responsible for sediment contributions through accelerated erosion and mass wasting including grazing, timber harvest, road construction and maintenance, and gravel mining.
- Garcia River is on CWA 303(d) list for impairment due to sedimentation.
- High water temperatures are an issue in some tributaries and/or sections of the Garcia.
- Estuary decreased in size due to sedimentation.
- Gravel mining is a concern in lower Garcia River.
- Steelhead and coho salmon are listed as threatened.

Solvent, petroleum and metals have been detected in groundwater and surface water at U.S. Air Force's Point Arena Station.

Efforts to Address Problems

- Cleanup activities continue at Point Arena Station
- Working to develop Total Maximum Daily Load (TMDL)* approach to reduce sedimentation and water temperatures in mainstem and tributaries and improve habitat conditions
- Mendocino County Water Agency has developed gravel management plan

- Court settlement following a bentonite spill into Gracia tributary being used for stream rehabilitation
- California Department of Fish and Game (DFG) stream restoration funds used in North Fork to improve habitat
- Adopt-a-Watershed education program is active in area K-12 classes
- Coastal Forest Lands, a timber company owning most of the North Fork, is developing a Sustained Yield Plan (SYP) which includes watershed management components.
- SWRCB and U.S. EPA have provided a grant for contract employee from U.S. EPA to develop 303(d) waste reduction strategy.
- California Department of Forestry (DOF) has targeted the Garcia for pilot long-term Forest Practice Rules monitoring program.
- California Resources Agency has targeted Garcia watershed for pilot data
- Integration effort.

Total Maximum Daily Load (TMDL)

The amount of a pollutant a waterbody can absorb, plus a margin of safety, and still meet water quality standards, including designated uses such as drinking water, aquatic life and recreation. A TMDL includes a quantitative assessment of water quality problems, pollution sources, and pollution reductions needed to restore and protect a river, stream or lake(Ref U.S.EPA).

Local Organizations Involved

- Mendocino County Water Agency
- Mendocino County Planning Department
- Mendocino County Public Works Department
- City of Point Arena
- Mendocino County Resource Conservation District
- Friends of the Garcia

- Sierra Club
- Mendocino Watershed Service
- CalTrout
- Coast Action Group

Noyo River Watershed

The Noyo River is a coastal tributary flowing to the Pacific Ocean at the City of Fort Bragg. The 66,000 acres watershed is dominated by redwood and douglas fir forest on rugged, mountainous terrain. Annual rainfall is 39 inches and the primary land use is timber harvesting by Louisiana Pacific, Georgia Pacific and the Jackson State Forest. The mouth of the Noyo is dominated by a marina and associated fish processing facilities. Fort Bragg uses Noyo River water as a primary source of drinking water.

Issues-Problems

- The city of Fort Bragg's Noyo River water supply is directly influenced by surface water and suffers from frequent siltation of the intakes.
- Anadromous fishery has experienced shifts in species composition probably due to decline in stream channel's average pool depth due to past logging practices.
- Noyo River is on CWA 303(d) list due to excessive sediment loading associated with historic logging, overgrazing and road building.
- Contamination from diesel, penti- and tetrachlorophenol and dioxins in stream sediments have been documented in Parlin Fork and Noyo River as result of past activities at a wood treatment plan at the CDF camp.
- Parlin Fork CDF camp has a sewage treatment plant under waste discharge requirements.
- Harbor must be dredged frequently due to large sediments amounts deposited upstream.

Efforts to Address Problems

- Perform waste discharger compliance inspections.
- Address highest priority groundwater cleanups and

remediations at Parlin Fork CDF camp.

- Promote continuing development and application of management practices for storage, treatment and disposal of hazardous substances.
- Maintain timber-related activities and focus on erosion controls.
- Continue to focus on Louisiana-Pacific and George-Pacific assessment and watershed planning.
- Develop strategy for addressing instream and up-slope problems with respect to land use activities within the existing regulatory framework.
- Develop a CWA 303(d) waste reduction strategy (TMDL).
- Promote habitat and riparian zone restoration activities.
- Regional Board participates in Coastal Salmon Natural Community System Initiative, Timber Harvest Review Team, and review of the SYPs as they are developed.

Local Organizations Involved

- Mendocino County Water Agency, Planning Department, Department of Environmental Health, and Resource Conservation District
- City planning departments
- City public works departments

Humboldt Bay Watershed

Humboldt Bay Watershed encompasses waterbodies tributary to the Pacific Ocean from Humboldt Bay north to, and including, Redwood Creek and all groundwater in the area. Major river systems are the Mad River and Redwood Creek. The Mad River is the drinking water and industrial supply for the Humboldt Bay area, which includes the cities of Eureka and Arcata. Areas around the bay are predominantly pastureland with limited cultivation. The hilly and mountainous areas are primarily in timber production.

Issues-Problems

- Urban runoff.
- River gravel mining.

- Compliance problems with local sewage treatment plants.
- Stream sedimentation from rural subdivisions.
- Need for erosion control educational materials and programs for small and rural landowners.
- Mad River and Redwood Creek listed on CWA 303(d) list for sedimentation affecting salmonid populations.
- Coho salmon and steelhead listed as threatened.

Efforts to Address Problems

- Inspections of permitted dischargers.
- Storm water permittees inspected on a risk basis.
- Work with agricultural, silvicultural and urban runoff dischargers through grant-funded projects, volunteer monitoring coordination.
- Coordinate activities with local agencies/groups.
- Support and promote educational opportunities for permitting, erosion control, wetlands values, aquatic habitat restoration.
- Maintain effective individual waste disposal systems program.

Local Organizations Involved (partial List)

- Humboldt County Planning Department, Department of Environmental Health, Agricultural Commissioner's Office, and Resource Conservation District
- Shellfish Technical Advisory Committee
- Humboldt Bay Harbor District
- United Dairywomen
- Farm Bureau
- Jacoby Creek Watershed Association
- American Fisheries Society
- Pacific Coast Restoration
- North Coast Gravel Association
- Trout Unlimited
- Salmon Unlimited
- California Forestry Association
- Redwood Community Action Agency
- Cal-Trout
- Salmonid Restoration Federation

Eel River Watershed

The Eel River watershed is located in highly erodible soils in the steep coastal mountains of the North Coast Region. It is heavily forested and heavily used for timber production. The watershed is lightly populated with domestic water supply a primary use of its water.

Issues-Problems

- Coho salmon and steelhead listed as threatened - federal Endangered Species Act.
- Eel and Van Duzen rivers are listed on the CWA 303(d) list of impaired streams with sedimentation identified as pollutant affecting anadromous fishery.
- A database of problems, sensitive areas and restoration is needed.
- Eel River watershed is large with many private lands making compilation of necessary water quality data difficult.
- Agency coordination poor.
- Salmon populations have decreased and squawfish populations have increased dramatically
- Concern regarding solid waste disposal and diversion of waste streams to reduce materials disposal volumes (e.g., recycling, composting "green" waste, petroleum contaminated soil, etc.)
- There are concerns about dairy industry and grazing impacts
- Mercury in Lake Pillsbury largemouth bass at concentrations approaching standards for fish flesh consumption
- Regulation of gravel extraction
- Possible impact to the river by road repairs and slides
- Timber harvesting practices.

Efforts to Address Problems

- Formation of Eel Watershed Team.
- A matrix is being established to clarify connection between goals and actions, and issues and problems.
- Continued adherence to North Coast Region Basin Plan which contains specific objectives and

implementation programs to protect and enhance area waters, specifically federal waste discharge permits.

- Continued enforcement of policies regarding individual wastewater systems, which provides guidelines for local agency jurisdictions to prevent water degradation from septic systems.
- Continuing efforts to coordinate watershed protection efforts with local agencies and groups and appropriate state and federal organizations.

Local Organizations Involved

- Round Valley Indian Reservation
- Humboldt and Mendocino County water agencies, planning departments, environmental health departments, agricultural commissioner's offices, and resource conservation districts
- Local water districts
- City planning departments
- City public works departments
- Farm Bureau
- United Dairywomen
- Eel-Russian commission
- Trout Unlimited
- Salmon Unlimited
- California Forestry Association

Smith River Advisory Watershed Smith River Advisory Council

The Smith River Advisory Council (SRAC) is an independent group of representatives from city, county, state, and federal agencies; fishing groups; Smith River watershed resource users; environmental groups; and industry. The representatives meet during scheduled public meetings to discuss Smith River fishery and watershed issues.

Purpose

The purpose of the Smith River Advisory Council is to actively promote forums that answer questions and solve problems concerning Smith River fisheries. This purpose also involves cooperatively

supporting a system-wide approach towards watershed management in the Smith River Basin.

Goals

The goals of the SRAC include the following:

- 1) Coordinate and integrate fishery research and enhancement efforts proposed by government agencies, enhancement groups and private industry on the Smith River.
- 2) Pursue funding sources to facilitate research and enhancement efforts on the Smith River.
- 3) Encourage or provide forums and materials to help educate the public about fishery/watershed issues of the Smith River Basin.
- 4) Facilitate the development of a Smith River fishery management plan that will benefit the biological, social and economic aspects of the Smith River Basin and Del Norte County. This includes influencing legislation and regulation changes.

Representatives

Representatives to the Council include the following agencies, industries and groups: Del Norte County, California Department of Fish and Games, U.S. Forest Service, U.S. Fish and Wildlife Services, Cal Trout, Smith River Alliance, sport fishermen, Del Norte Fishermen's Marketing Association, Lily Bulb Growers, Reservation Ranch, California State Parks, University of California Sea Grant, Humboldt State University - Fisheries Department, River Guides Association, gravel extractors, dairy farmers, Stimson Lumber Company, California Conservation Corps, Rowdy Creek Hatchery, Bar-O Boys Ranch, Redwood National Park, Rural Human Services, private consultants, River Institute, private citizens, Native American groups, and Friends of Del Norte.

San Francisco Bay Region

San Francisco Bay Watershed

The San Francisco Bay estuarine system conveys the waters of the Sacramento and San Joaquin rivers into the Pacific Ocean. Located on the central coast of California, the bay system functions as the only drainage outlet for waters of the Central Valley. It also marks a natural topographic separation between the northern and southern coastal mountain ranges. The watershed's waterways, wetlands and bays form the centerpiece of the United States' fourth-largest metropolitan region, including all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties.

Issues-Problems

- Bay dredging and disposal of dredging wastes.
- Invasive species.
- Urban runoff.
- Mercury levels.
- Erosion.

Efforts to Address Problems

The San Francisco Bay Estuary Project developed the Comprehensive Conservation and Management Plan (CCMP) in 1993. Implementation of the CCMP's 140-plus recommended actions is underway. Actions address erosion control, vessel waste, invasive species, pollution prevention, urban runoff, watershed management planning and the wetlands ecosystem goals project.

Specific activities are ongoing for:

- TMDLs for specific chemicals
- Bay dredging and disposal
- Regional monitoring
- Interfacing with others on Bay-Delta issues
- Effluent toxicity control program
- Basin plan updates
- Site specific water quality objectives
- Long-term mercury strategy
- Bay Protection and Toxic Cleanup Program
- Selenium strategy for region's petroleum refineries
- Erosion and sedimentation
- Wetlands ecosystem goals project

Local Organizations Involved

Alameda County Watersheds

- Friends of San Leandro Creek
- Alameda County Public Works
- Friends of Sausal Creek
- City of Oakland
- Friends of Five Creeks, Albany

Contra Costa County Watersheds

- San Francisco Estuary Institute
- Urban Creek Council
- East Bay Regional Parks District
- Friends of Creeks, Walnut Creek
- Lindsay Museum
- Contra Costa County RCD

Subregional Watershed Activities

Napa River Watershed

The Napa River Watershed is located in western Napa County, just north of San Francisco Bay. The watershed encompasses approximately 210 square miles of lands and waterbodies that drain into the Napa River. Mount St. Helena, situated north of Calistoga, forms the headwaters of the Napa River, which runs south toward San Pablo Bay. The river is intermittent in the northern reach; it then becomes perennial due to groundwater discharge. The Napa River is a significant freshwater tributary to San Francisco Bay. The Napa River is included in the 303(d) list of impaired waterbodies due to siltation, nutrients and pathogens.

The dominant land use in the Napa Valley is agriculture. Napa Valley is well known for its wineries and scenic vineyards. There are approximately 240 wineries and a tourist industry that brings approximately 4.7 million visitors to Napa County each year.

Issues-Problems

- Agricultural runoff.
- Erosion control.
- Urban runoff.
- Wetlands loss.
- Wastewater discharges.

Efforts to Address Problems

In 1994 the Napa RCD led stakeholders in producing the *Napa River Valley Owners Manual*, an integrated resource management plan. The Napa RCD has stewardship programs in up to seven creeks in this watershed. A sustainable viticulture group of stakeholders is producing a BMPs manual; Napa RCD facilitated a stakeholders group which developed BMPs for orchard heaters. Napa County has an erosion control ordinance for both new and replanted vineyards and land grading where slope exceeds 5 percent. Strategic enforcement is planned. The RCD, Napa County and CDF are seeking to resolve issues related to converting forestlands to vineyards.

Regional Board staff is working with Napa municipalities to improve management of new development and requiring appropriate BMPs.

Santa Clara Basin

The Santa Clara Basin encompasses the extreme south bay below the Dumbarton Bridge and those areas of Santa Clara County that drain to the south bay, the Santa Clara Valley. The valley consists of 11 sub-basins, including the Coyote Creek watershed on the east side, the Guadalupe River that drains the south-central portion of the valley and a series of small, relatively urbanized watersheds that drain the west side. The planning area has a population of some 1.3 million and is mostly urbanized.

Issues-Problems

- Dense population (1.3 million) in small area.
- The extreme south portion of San Francisco Bay is poorly flushed, causing water quality criteria for certain toxic pollutants to be exceeded.
- Aquatic/riparian habitats are in various states of degradation.
- Several reservoirs/creeks are impaired due to mercury levels.

Efforts to Address Problems

The Regional Board initiated a watershed management effort in the Santa Clara Basin

in 1996. Local agencies, and environmental and community organizations embraced this opportunity to accept responsibility for local stewardship and have committed to implement a watershed management planning process integrating:

- Habitat and water quality protection and enhancement
- Water rights and water supply reliability
- Flood management
- Regulatory compliance
- Land use
- Public awareness and involvement.

Central Valley Region

The Central Valley Watershed is currently the subject of extensive evaluation by a joint state and federal process of the CALFED agencies. The issues and the restoration efforts being performed by CALFED are briefly summarized later in this chapter.

Central Coast Region

Salinas River Watershed

The Salinas River Watershed covers some 4,600 square miles and lies within San Luis Obispo and Monterey counties. Agricultural operations comprise its primary land use with such operations contributing to a gross annual agricultural value of approximately \$1.5 billion to \$2 billion. Other land uses include recreation, military occupation and exploitation of mineral and oil reserves from various locations.

Issues-Problems

- Salinas Valley groundwater overdraft-sea water intrusion.
- Nitrates in groundwater.
- Erosion and sedimentation.
- Metals contamination from mining activities.
- Pesticide contamination of surface and groundwater.
- Surface and groundwater contamination from oil fields.

- Salt build-up in groundwater.

Efforts to Address Problems

The Salinas River Watershed Team was established in January 1996 to investigate and focus on nonpoint source problems while assuring that the watershed's point source commitments are satisfied. Current effort is focusing on coordination with ongoing efforts by several organizations active in the watershed, including the Monterey Bay National Marine Sanctuary, the USDA Natural Resources Conservation Service and Monterey County Water Resources Agency. Within the next two years, five 319(h) projects awarded in the Salinas watershed will address restoration of wetlands, nitrates in groundwater, erosion and sedimentation from agricultural fields, citizen monitoring and regulatory coordination.

The following is a timetable for development and implementation of a watershed management action plan for the Salinas River Watershed:

Salinas Watershed Priority Activities and Schedule

Priority Activities	Fiscal Year(s) Activity Occurs
Implement ongoing watershed activities initiated by others	Ongoing through 2003
Characterize the watershed	Ongoing through 1998
Identify and evaluate water resources issues/areas	Ongoing through 1998
Develop a watershed management action plan	1998 through 1999
Implement the watershed management action	1999 through 2003

plan	
Evaluate progress	Ongoing through 2003

Local Organizations Involved

- Association of Monterey Bay Area Governments
- California State University, Monterey Bay, Watershed Institute
- Center for Marine Conservation
- Moss Landing Marine Laboratory
- Water Quality Protection Program, Monterey Bay National Marine Sanctuary
- USDA, NRCS
- Monterey County RCD
- Monterey County Water Resources Agency

San Lorenzo Watershed

The San Lorenzo Watershed covers approximately 140 square miles and lies within Santa Cruz County. The watershed encompasses the entire San Lorenzo hydrologic unit. The San Lorenzo River flows southerly from Waterman Gap to the Pacific Ocean. The main tributaries include Bean, Bear, Boulder, Branciforte, Carbonera, Clear, Fall, Kings, Lompico, Newell and Zayante creeks.

Issues-Problems

- Elevated nutrient and bacteria levels from septic tanks, horse corrals, urban runoff.
- Accelerated erosion from urban development and poor road maintenance.

Efforts to Address Problems

Santa Cruz County has implemented a watershed management plan to address all three major problems. Regional Board staff is working with the County to develop a memorandum of understanding regarding construction and maintenance of alternative wastewater treatment systems. Board staff is also developing minimum nitrogen removal limits for onsite treatment and disposal systems. These limits will support implementation of a TMDL program being developed by county and Regional Board

staff. BMPs for horse corrals have been developed. A federal 319(h) grant will also implement corrective measures to address erosion problems and a TMDL will be developed by the Regional Board by 2005 to address this problem.

Local Organizations Involved

- Natural Resources Conservation Service
- Santa Cruz County Resource Conservation District
- San Lorenzo Watershed Caretakers
- County of Santa Cruz
- University of California Santa Cruz
- California Department of Forestry

Morro Bay Watershed

The Morro Bay Watershed covers approximately 75 square miles and lies within San Luis Obispo County. The watershed encompasses the entire Chorro and Los Osos hydrologic unit. Chorro Creek and Los Osos Creek flow predominately westerly and drain into Morro Bay. The main tributaries in the Chorro Creek hydrologic unit include Dairy Creek, San Luisito Creek and San Bernardo Creek. Los Osos Creek has no tributaries.

Issues-Problems

- Sedimentation and erosion control.
- Bacterial contamination caused by failing septic tanks, agricultural sources, recreational boaters and urban runoff is increasing to a point where many shellfish growing beds are no longer viable.
- Nitrate groundwater levels in Los Osos and Chorro Creek basins elevated.
- Nitrates and phosphates in surface water sometimes violate Basin Plan objectives due to septic systems, fertilizers, animal waste and urban runoff.
- Heavy metals in sediments due to abandoned mine discharges of chromium, nickel and other metals from the upper watershed.

Efforts to Address Problems

Morro Bay is one of 28 estuaries participating in the National Estuary Program which will provide funding for a three year period to develop a watershed plan to address these problems. The program is directed by the Local Policy Committee, which includes local, state and federal agencies and private stakeholders. A draft management plan for the Morro Bay watershed was available in the summer of 1997.

One of 17 National Monitoring Programs is located in the Morro Bay watershed. This provides data needed to develop TMDLs, prioritize BMPs, make long-term management decisions, and transfer lessons learned to other watersheds.

Local Organizations Involved

- Natural Resources Conservation Service
- Coastal San Luis Resource Conservation District
- UC Cooperative Extension
- Morro Bay Natural History Museum
- Bay Foundation of Morro Bay
- Friends of the Estuary
- Cal Poly, San Luis Obispo

Sixty other agencies participate in Morro Bay Task Force. This coordinated effort has brought about implementation of BMPs, changes in coastal zone planning documents, better coordination of California Environmental Quality Act (CEQA) projects and coordination of permitting processes.

Santa Ynez River Fisheries Management Plan

Background

Cooperators:

- Bureau of Reclamation
- Fish and Wildlife Service
- California Department of Fish and Game
- Cachuma Conservation Release Board
- Santa Ynez River Water Conservation District, Improvement District #1
- Santa Ynez River Water Conservation District

- Santa Barbara County Water Agency

Objectives/Goals:

A program of cooperative fisheries investigations has been underway on the Santa Ynez River since 1993 to identify reasonable flow and non-flow measures that will improve conditions for fish populations, within the context of overall management objectives and competing demands on the Santa Ynez River. A Management Plan will be developed to present to the State Water Resources Control Board in water hearings in the year 2000. The objectives of this cooperative program are to:

- Improve habitat conditions to maintain fish populations in good condition.
- In particular, protect, maintain, and improve habitat conditions for species listed under the State and Federal endangered species acts or identified as California Species of Special Concern.
- Improve the availability and suitability of stream corridor and channel habitat for a diversity of species of fish and wildlife.

Alternative management recommendations will be developed and evaluated in context with other management objectives for the river. The comparative feasibility of various alternative management actions in achieving these management objectives will be evaluated with respect to the following criteria:

- The proposed management action has a high probability of achieving the desired benefit.
- The management action can be reasonably implemented considering the constraints imposed by natural hydrologic conditions.

Geographic Coverage, Landuse and Ownership:

The cooperative program focuses on the Santa Ynez River basin (Santa Barbara County), particularly the lower Santa Ynez River and tributaries below Bradbury Dam. Landuse in the Santa Ynez River watershed

includes agriculture, grazing, urbanization, recreation, and open space. Landowners include the U.S. Forest Service (Los Padres National Forest in the upper river), U.S. Bureau of Reclamation (near Lake Cachuma), municipalities and private landowners (especially below Bradbury Dam).

Historic and/or Current Steelhead Abundance and Distribution:

Current abundance of steelhead in the Santa Ynez River is a fraction of historic levels, which fluctuated naturally depending on rainfall. The historic steelhead run has only been qualitatively estimated, based on a single qualitative comparison. Mr. Tegen, a trapper for the California Department of Fish and Game who saw the 1943-44 steelhead run in the Santa Ynez River, stated that he believed it to be at least equal in size to the runs he had seen at Benbow Dam on the Eel River during 1939 and 1940 (Shapavalov 1944a&b). Those runs were estimated at 12,995 (1939) and 14,476 (1940) steelhead (Shapavalov and Taft 1954). The 1944 run may have been above average, given unusually wet conditions in prior years and fish rescue operations by CDFG. Between 1939 and 1946, CDFG conducted an intensive fisheries management program to enhance the steelhead population, moving juveniles from drying areas of the river to larger pools in the lower river, the lagoon, upstream tributaries and reservoirs in the basin, and several out-of-basin streams. A severe drought in 1947-1951 decimated the steelhead run because streamflows were inadequate for upstream migration and spawning. Steelhead were cut off from upstream spawning habitat by Gibraltar Dam (completed in 1920) and Bradbury Dam (1953). Recent surveys suggest that small numbers of steelhead can enter the Santa Ynez River to spawn, usually in the lower tributaries (Salsipuedes and El Jaro Creeks, and possibly San Miguelito Creek). Large numbers of residualized steelhead still exist in the upper watershed, including in Jameson Lake where they are protected by the management practices of the Montecito Water District. Additional studies are underway to determine where steelhead still utilize the Santa Ynez River.

Factors for Decline

Problem Areas:

- Habitat Modification or Destruction
- Disease or Predation
- Other Natural or Manmade Factors
- Over-utilization
- Inadequacy of Existing Regulatory mechanisms

Explanation

The decline of steelhead populations in the Santa Ynez River and the continued low population levels are probably the result of many factors. Land use activities (e.g. agricultural practices, urbanization) and water management activities (e.g. dams, diversions, flood control projects, ground water pumping), as well as natural occurrences (e.g. severe droughts in 1947-1951 and 1987-1991) affect habitat availability in the basin. Fisheries management activities such as introduction of nonnative fish (e.g. black bass, catfish) and stocking practices may have affected steelhead populations through predation and competition.

Watershed Project Details

Proposed Projects/Restoration and Effects on Steelhead and Associated Habitat

A range of potential management alternatives has been identified for evaluation and prioritization, using data from existing sources and ongoing investigations. The alternatives are grouped into four geographic regions (mainstem below Bradbury dam, tributaries below the Dam, mainstem above the Dam, and tributaries above the Dam). For each region we considered four types of mitigation or enhancement measures: flow related, habitat enhancement, predator control, and supplementation of fish numbers.

Stage/Phase of Project

The Santa Ynez River Technical Advisory Committee is currently preparing a

Management Alternatives Report that will provide an initial screening of the potential alternatives outlined above. The report will also identify data gaps that need to be addressed in order to complete evaluation of the alternatives. This will guide implementation of the current studies. Some alternatives have been or will be implemented, such as the Hilton Creek siphon/pump.

Funding

Steelhead conservation has had and will continue to have dedicated funding in the Santa Ynez River. Funds dedicated to conservation activities in the Santa Ynez River come from an assessment on water taken from the Cachuma project (\$10 per acre-foot) and on use of the reservoir (\$43 per acre foot), providing \$257,000-\$500,000 per year. Also, the Santa Barbara County Water Agency is also required under a contract with local agencies to provide \$100,00 annually for conservation-type activities. The cooperative program has been funded by the local water agencies since 1993, at levels ranging from less than \$200,000 per year and rising to about \$300,000 in 1997. In the future approximately \$300,000 per year will continue to be dedicated to steelhead conservation. Furthermore, the water agencies have been funding \$60,000 per year to the U.S. Bureau of Reclamation for involvement by the U.S. Fish and Wildlife Service. In addition, the participating agencies provide a wide range of in-kind services for the program.

Implementation

Some actions are already being implemented to improve conditions for steelhead in the Santa Ynez River. For example, the Santa Ynez Technical Advisory Committee has 2000 AF available from Cachuma Reservoir to use for fisheries investigations and maintenance of fisheries downstream of Bradbury Dam. One of the management alternatives identified above, pumping water into Hilton Creek, has already been implemented. Since late March 1997, the U.S. Bureau of Reclamation has been pumping water from Lake Cachuma into Hilton Creek, a small tributary immediately

downstream of Bradbury Dam. The objective is to provide habitat for rainbow trout/steelhead as mitigation for habitat that was lost when seismic retrofit activities dewatered the Bradbury Dam stilling basin. Eleven rainbow trout/steelhead were relocated to Hilton Creek, where the USBR has pumped 4 cfs to maintain 0.25 miles of habitat. Spawning in Hilton Creek was successful this year, and young-of-the-year fish were recently observed in the mainstem just below Hilton Creek. Plans are currently underway to design and implement a permanent pump/siphon system to maintain flows in Hilton Creek. This project will enhance 0.25 miles of habitat and, with the removal of certain passage barriers, create an additional 700 feet of new habitat.

In March, 1997, approximately 1000 predatory non-native fish were removed from the stilling basin below Bradbury Dam in conjunction with the USBR's Safety of Dams activities. Another management action, releasing water to the mainstem Santa Ynez River near Rucker Road to help maintain contiguous flow with Salsipuedes Creek, is currently being investigated for implementation. Investigations are ongoing to determine the most promising management alternatives that will be recommended to the SWRCB in 2000.

Literature Cited

- Shapovalov, L. 1944a. Memorandum of Santa Ynez conditions. California Department of Fish and Game memorandum.
- Shapovalov, L. 1944b. Preliminary report on the fisheries of the Santa Ynez River system, Santa Barbara County, California. Bureau of Fish Conservation, California Department of Fish and Game. 22 pp.
- Shapovalov, L. and A.C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Onchorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California

Department of Fish and Game Bulletin, No. 98.

Los Angeles Region

Calleguas Creek Watershed

Calleguas Creek and its major tributaries, Revolon Slough, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa and Arroyo Simi, drain an area of 343 square miles in southern Ventura County and a small portion of western Los Angeles County. This watershed is about 30 miles long and 14 miles wide. Land uses vary. Urban developments are generally restricted to the city limits of Simi Valley, Moorpark, Thousand Oaks and Camarillo. Most upland areas are open space, although it is increasingly popular to locate golf courses in these vacant areas. Agricultural activities are spread out along the valleys and on the Oxnard Plain. Mugu Lagoon at the mouth of this watershed is one of the few remaining significant salt water wetland habitats in southern California. Point Mugu Naval Air Base is in the immediate area.

Issues-Problems

- Aquatic life in both Mugu Lagoon and inland streams are impacted by nonpoint sources.
- Contamination from DDT, PCBs, other pesticides, some metals from nonpoint sources, and high levels of mineral and nitrates, most coming from agricultural activities through continued disturbance and erosion of historically contaminated soil.
- Reproduction impaired in resident endangered species, the light-footed clapper rail.
- Residential and urban activities.

Efforts to Address Problems

Some 60 stakeholders have formed a watershed group with major focus on agricultural and flood control issues. The group has developed guidelines for a watershed management plan. Ongoing nonpoint source efforts include use of federal and other funding. Federal grant

projects, special studies and other activities include:

- Irrigation Demonstration Project by Ventura County Resource Conservation District (VCRD) demonstrated the water quality and conservation benefits of drip irrigation.
- VCRD began the Erosion Control Demonstration Project to demonstrate erosion control techniques for stream bank stabilization and soil conservation in watershed orchards. Techniques include mulches and cover crops between orchard rows.
- Water samples collected quarterly during 1992-93 by UC Davis indicated sporadic toxicity with strong implication of organophosphate pesticides.
- Regional Board staff participate in the Mugu Lagoon Task Force to exchange data and discuss coordinated ways to solve watershed problems.
- The majority of Calleguas Creek Watershed permits were revised in 1996. Ventura County Municipal Stormwater NPDES Permit was issued in 1994.

Santa Monica Bay Watershed

Santa Monica Bay Watershed encompasses 414 square miles. Its borders reach from the crest of the Santa Monica Mountains on the north and from the Ventura-Los Angeles County line to downtown Los Angeles. It extends south and west across the Los Angeles plain to include the area east of Ballona Creek and north of Baldwin Hills. It includes several sub-watersheds; the two largest are Malibu Creek to the north and Ballona Creek to the south. Malibu Creek is comprised of large undeveloped mountain areas, large acreage residential properties and many natural stream reaches; Ballona Creek is predominantly channelized and highly developed with residential and commercial properties.

Issues-Problems

- Human health risks, primarily associated with recreational uses of Santa Monica Bay.
- Encroachment by human development contributes to the disappearance or degradation of natural habitats.

Efforts to Address Problems

Santa Monica Bay was included in the National Estuary Program in 1989. A watershed plan was developed in 1994. The Santa Monica Bay Watershed Council was formed in 1994 to oversee plan implementation. Council staff will work with Regional Board staff to carry out the board's watershed approach.

- Major permits were revised by June 1997.
- Los Angeles County (within which this watershed resides) was issued a renewed municipal storm water permit in 1996.
- As part of the Bay Restoration Plan, Regional Board will work with the Watershed Council to develop mass emissions estimates for inclusion in permits as goals.
- Work continues with the Watershed Council, Implementation Committees for Ballona Creek and Malibu Creek and other Santa Monica Bay Watershed stakeholder groups to identify modification and/or new nonpoint measures to be implemented through the Bay Restoration Plan of individual Ballona Creek and Malibu Creek plans.

Local Organizations Involved

Over 70 federal, state and local agencies, environmental organizations, businesses and user groups are involved in the Santa Monica Bay Restoration Project's Bay Watershed Council.

Local agencies include:

- Cities of Agoura Hills, Beverly Hills, Calabasas, Culver City, El Segundo, Hermosa Beach, Inglewood, Los Angeles, Malibu, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling

Hills, Rolling Hills Estates, Santa Monica, Thousand Oaks, Torrance, West Hollywood and Westlake Village

- Bureaus of Engineering and Sanitation, city of Los Angeles
- County Sanitation Districts of Los Angeles
- Las Virgenes Municipal Water District
- Los Angeles County departments of Public Works, Beaches and Harbors, Health Services and Fire -Lifeguards
- Resource Conservation District of the Santa Monica Mountains
- West Basin Municipal Water District
- Los Angeles Regional Water Quality Control Board
- Santa Monica Mountains Conservancy
- Chevron Companies, El Segundo Refinery
- Los Angeles Department of Water & Power
- Southern California Edison
- Ballona Lagoon Marine Preserve
- Heal the Bay
- Santa Monica BayKeeper
- Sierra Club-Angeles Chapter
- Los Angeles Rod and Reel
- Brash Industries

Ventura River Watershed

The Ventura River and its tributaries drain a coastal watershed in western Ventura county. It covers 235 miles situated within the western Transverse Ranges.

Topography in this watershed is rugged and, as a result, the surface waters that drain the watershed have very steep gradients, ranging from 40 feet per mile at the mouth to 150 feet per mile at the headwaters. Precipitation varies. Most occurs as rainfall between November and March. Snow occurs at higher elevations, but melting snowpack does not sustain significant runoff in warmer months. The erratic weather pattern, coupled with the steep gradients, result in high flow velocities with most runoff reaching the ocean.

Issues-Problems

- Eutrophication, especially in estuary/lagoon.
- High total dissolved solids (TDS) concentrations impair use of water for agriculture.

Efforts to Address Problems

- Ventura County Municipal Stormwater Permit issued in 1994.
- Ventura River Watershed TMDL activities involve investigating sources of low dissolved oxygen in the river in area of a wastewater treatment plant.
- Work continues to determine scope of water quality impacts from agricultural runoff.
- Staff is pursuing the resumption of stakeholder meetings to assist in developing a watershed management plan to address reduction of point source and nonpoint source pollutants.

Santa Clara River Watershed

The Santa Clara River is the largest river system in southern California that remains in a relatively natural state. Extensive patches of high quality riparian habitat are present along the length of the river and its tributaries. One of the largest of the river's tributaries, Sespe Creek, is designated a wild trout stream by the state, and it is also a wild and scenic river. The river serves as an important wildlife corridor. A lagoon at its mouth supports a large variety of wildlife.

Issues-Problems

- Limited data is available for much of the Santa Clara River.
- Increasing development in flood plain areas necessitates channelization, resulting in increased runoff, erosion and loss of habitat.
- Natural oil seeps discharge significant amounts of oil into Santa Paula Creek.

Efforts to Address Problems

- Staff participation in the Santa Clara River Enhancement and Management

Plan is generating a draft report. Overlay analysis currently being done by contractor.

- Continuing core regulatory activities to be integrated into the watershed management approach will include renewal/revision of NPDES permits. This is a targeted watershed for the bulk of permit renewal purposes in FY 2000-01. Compliance inspections, review of monitoring reports, response to complaints, and enforcement actions relative to NPDES permits will continue.

Model Restoration Watersheds

Central Valley Watershed – CALFED

Activities to restore aquatic species in the Central Valley and the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) system are much further along than they are for coho and steelhead in the coastal watersheds. The CALFED Bay-Delta program is developing and implementing these programs. The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan to restore ecosystem health and improve water management for beneficial uses in the Bay-Delta system.

A brief summary of CALFED and its activities follows (details of these activities is available from the CALFED office at 11th floor, 1416 Ninth Street, Sacramento, California 95814, (916) 657-2666):

CALFED was established under a framework agreement by state and federal agencies signed in July 1994. The number of cooperating agencies has expanded from the original and includes state and federal agencies which have responsibility for water, fish or wildlife resource management in the Bay-Delta watershed:

Federal Agencies

- U.S. Bureau of Reclamation
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- National Resources Conservation Service
- Bureau of Land Management
- Western Area Power Administration

State Agencies

- State Water Resources Control Board
- Resources Agency
- California Environmental Protection Agency
- Department of Food and Agriculture
- Department of Water Resources

In the early 1990's both winter-run salmon and Delta smelt were listed as threatened species under both the state and federal endangered species acts. These listings and other actions have led to many activities that are currently in place and being implemented to protect not only these listed species but to establish a multi-species approach to ecosystem restoration. These activities are currently coordinated by the CALFED agencies. These activities include:

- Development of a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses in the Bay-Delta system (including a draft EIR/EIS).
- Implementation on the Central Valley Project Improvement Act (PL 102-575).
- Implementation of California Bay-Delta Environmental Enhancement and Water Security Act approved by the voters of California as Proposition 204 (nearly \$1 billion in state funding for Bay-Delta related activities).
- Allocation of funds under the federal appropriation in the California Bay-Delta Ecosystem Restoration account

which authorized \$143 million dollar per year for 1998, 1999 and 2000 (actual appropriation for FY 1998 is \$85 million).

- Coordination of ecosystem restoration funding from water district contributions under Category III of the 1994 Bay-Delta Accord (\$10 million dollars per year).
- Adaptive modifications of the operation of the State Water Project and the federal Central Valley Project consistent with the 1994 Bay-Delta Accord, Biological Opinions for winter-run salmon and Delta smelt, water right permits and the 1995 Bay-Delta Water Quality Control Plan.
- Development of a programmatic habitat restoration plan (HCP) for the Bay-Delta watershed in support of the CALFED program.

To help guide Bay-Delta restoration activities, CALFED distributed a draft of its Ecosystem Restoration Program Plan (ERPP) in three separate volumes during the summer and fall of 1997 for public review. Volume 1, *Visions for Ecosystem Restoration*, describes the important ecological processes, habitats, species and stressors that constitute the ecosystem elements forming the foundation of the Ecosystem Restoration Program. Volume II, *Ecological Zone Visions*, integrates the ecosystem elements in Volume I on an ecological zone basis. Volume III, *Visions for Adaptive Management*, describes adaptive management, phased implementation, ecosystem monitoring and focused research and begins to identify the indicators of ecological health. The ERPP will form the basis of the core ecosystem program to be implemented under the CALFED Bay-Delta Program.

In addition, CALFED is implementing a coordinated review for the funding of restoration projects proposed for funding in 1997-98. An RFP was released during the summer of 1997 for specific projects to be funded from \$60 million in proposition 204 funding, \$10 million Category III funds and \$1 million in federal EPA funding, totaling \$71 million for 1997-98. Review teams were

developed to analyze the 150 proposals that were received. The ecological program goals set forth in the ERPP were used to guide the acceptability of the proposals along with other criteria. Final awards for successful projects were announced in late 1997. A new round of RFPs for \$56 million of 1998 grants is expected to take place in late 1998.

The Cosumnes River and the American River

The Cosumnes River is important since it one of the few undammed rivers flowing to the Central Valley, there is significant conservation work occurring on the lower reaches of the river (e.g. the work on the Nature Conservancy), and there is a watershed organization (the fledgling Cosumnes River Partnership). The upper watershed work involves such organizations as the Forest Service, Sierra Pacific Industries (California's largest industrial forestland owner), and the El Dorado County Resource Conservation District. One of the \$973 thousand in Proposition 204 funds granted to the El Dorado County Resource Conservation District, \$565 thousand focuses on the Cosumnes River watershed.

The American River is important for its size and high quality water. The American River Watershed Group (ARWG) provides an excellent example of a strong watershed organization. Signatories to the ARWG memorandum of understanding include state and federal agencies, local government (including Placer and El Dorado Counties), local water agencies, economic development districts, resource conservation district, and forestland owners. Proposition 204 funding and related in-kind commitments secured by Placer County and the El Dorado County Resource Conservation District will result in the investment of close to \$2 million in watershed health, monitoring, and education activities. Several of the watershed health projects focus on reducing the risks of catastrophic wildfire and its adverse

watershed impacts. The California Department of Forestry and Fire Protection and the Forest Service are key players in the implementation of these projects. With an initial focus on the North and Middle Forks of the American River, and ARWG is now broadening its focus and participants to include the South Fork.

Trinity River Watershed

Following completion of the Trinity River Project in 1963, fish and wildlife populations in the Trinity River declined dramatically. To reverse this decline, a 13-agency Trinity River Basin Fish and Wildlife Task Force was formed in 1974, and state and federal funds were budgeted to define problems, develop solutions and begin restoring the river.

One of the most significant problems identified was the inflow of decomposed granitic sand from Grass Valley Creek into the Trinity River. In September 1980, Congress passed Public Law 96-335, which authorized construction of Buckhorn Mountain Debris Dam on Grass Valley Creek and sediment dredging in the Trinity River below Grass Valley Creek. This act required equal sharing of sediment dredging costs between the state and federal governments.

In September 1982, DFG, DWR and USBR signed a five-year sediment dredging agreement. This agreement provided that DWR would be responsible for all work related to sediment dredging until October 1988. After that date, DWR would continue to perform this work under contract to USBR.

In October 1984, Congress passed PL 98-541, which authorized the Trinity River Basin Fish and Wildlife Restoration Program. This act provided \$57 million (in addition to the Buckhorn Mountain Debris Dam on Grass Valley Creek) to implement actions needed to restore fish and wildlife populations in the Trinity River Basin. The act required the state to pay 15 percent of the total program costs. A joint Memorandum of Agreement

(MOA) between DFG, DWR, and USBR commits the state agencies to each pay 7.5 percent of these costs. The Trinity County RCD has been heavily involved with grants from other sources (\$3.5 million), with local groups and the California Conservation Corps to implement on-the-ground sediment control projects in the Grass Valley watershed.

Congress recently extended the program for three years, to September 30, 1998, to allow expenditure of funds previously authorized, but not yet appropriated. The restoration work that needs to be accomplished will not be completed by the end of the three-year extension. It is not known if the program will be continued after that date.

The Trinity County RCD initiated and manages the 36 square-mile Grass Valley Creek watershed project (a CRMP), which has received national acclaim. Fourteen state, federal and local agencies, including USBR and USFS, are partners with the RCD. Agency funding support has totaled more than \$5 million over five years. In addition, several industrial timber companies have joined the partnership and contributed resources.

Grass Valley Creek drains into the South Fork of the Trinity River, and the sediment load has adversely impacted the river's renowned salmon and steelhead fisheries. The major problems being addressed are soil erosion from pre-existing logging projects and current recreational uses. The project involves fish habitat restoration; channel stabilization; slope stabilization with native grasses, trees and shrubs; erosion control; technical assistance to private landowners; employment of displaced loggers; and logging road obliteration or improvement.

With the project nearing completion, the district has facilitated a buyout of Champion Lumber Company's timberland by BLM, which has assumed ownership and management responsibilities. As of 1995, 10,000 acres have been treated for erosion at about 800 sites using 490,000 trees, shrubs and grass plugs, and 62 miles of roads have been reconstructed to

acceptable standards or “put to bed.” The project is a model of locally led conservation involving productive partnerships with agencies and private property owners at all levels. The project has been an economic boon to the community in addition to addressing a major resource issue.

Sacramento River Watershed

The Upper Sacramento River Fisheries and Riparian Habitat Restoration Plan (Upper Sacramento River Plan) was prepared in response to Senate Bill 1086 adopted as state policy by Senate Concurrent Resolution No. 62 in September 1989. The plan identified 22 actions needed to protect, restore and enhance the fishery and riparian habitat of the Upper Sacramento River System. Twenty of these actions were designed to help restore and enhance the salmon and steelhead fisheries in the upper river. The other two actions described a conceptual program intended to protect, restore and manage a continuous riparian ecosystem along the Sacramento River and the lower reaches of its major tributaries between Keswick Dam and the confluence of the Feather River near Verona.

Work to implement the Upper Sacramento Plan has progressed over the past eight years. A series of budget augmentation requests have been submitted to fund implementation of various actions and continued development of a riparian habitat management plan. Numerous state agencies provide staff support to the Advisory Council and its Riparian Habitat Committee under the auspices of the Resources Agency to develop a consensus list of specific actions to implement the conceptual riparian management program described in the 1989 plan.

The Lower Sacramento River Riparian Habitat Revegetation Study is a joint feasibility study between the U.S. Army Corps of Engineers (Corps), DWR and the Reclamation Board. Its purpose is to evaluate and provide the basis to restore riparian and shaded aquatic riverine habitat (SRA) along the Lower Sacramento River

from Collinsville to Verona, including Steamboat and Sutter sloughs. The study was originally conceived as an evaluation of fish migration along the Lower Sacramento River. The pre-feasibility study was completed based on this purpose. When the Corps came to DWR looking for a local sponsor for the fish migration feasibility study, it was difficult to determine interest and DWR ceased its participation. Later, the Metropolitan Water District of Southern California indicated to the Reclamation Board that it would be interested in funding at least part of the local sponsor's share if the study evaluated riparian and SRA habitat instead of fish migration.

The Corps and Reclamation Board applied for Category III funding (under the 1994 Bay-Delta Accord) for the local sponsor share. The total cost of the three-year study is estimated at \$2.8 million with the local sponsor paying half. Up to one-half of the local sponsor's share can be in-kind services. Category III approved one year's costs (\$500,000 sponsor's share). The Corps' project study plan was modified as Phase 1 (the first year) and Phase 2 (the remainder of the project) and includes a demonstration project.

The study will include a habitat survey of the Sacramento River from Verona to Collinsville, including Steamboat and Sutter sloughs, to look for possible constraints and opportunities for planting SRA. Based upon information from these surveys, candidate habitat restoration sites will be identified. Five prototype sites that are representative of the Sacramento River system will be developed from these candidate sites. Plans and conceptual designs for creating SRA on these sites will be developed to a level of detail sufficient to estimate costs for the prototype sites.

Another purpose of the study will be to determine the flexibility of relaxing the standards of planting on levees. The study will be undertaken with the advice and input of other regulatory agencies having jurisdiction in the Delta and include public scoping meetings and environmental workshops.

Mendocino County Watersheds

The Mendocino RCD is currently working on three major watershed projects, the Garcia, the Tomki and the Dooley watersheds. It is currently assessing and prioritizing five additional watershed projects. Significant erosion treatments are being applied to streambed degradation. Bioengineering practices, integrating vegetation and structural designs are being used to solve stream bank problems.

Tomki Watershed Project

Within the Tomki Creek watershed, located in the upper mainstem Eel, Mendocino RCD has been leading a watershed and stream restoration effort for several years. The Natural Resources Conservation Service is the lead agency, and the RCD enlisted the support and cooperation of many large and small landowners in the watershed. Riparian revegetation and bank stabilization have been widely used in the Tomki Creek program. The Mendocino RCD has also begun similar work in the Tenmile Creek watershed.

The Tomki Creek Watershed Plan, completed by the RCD and local citizens' advisory committee in 1983, is one of the first watershed restoration projects in the north coast. The project, now in its fourteenth year of operation, has continued to receive recognition, making Mendocino County a leader in watershed restoration. The success of the project is largely due to the long-term commitment of landowners and the RCD in carrying out plan recommendations.

An \$18,000 EPA grant from the California Association of Resource Conservation Districts funded the production of a video, "*Watershed Restoration: How to Heal the Land*." The grant enabled the RCD to document the work in the Tomki Watershed. The RCD contracted with the Mendocino County U.C. Extension to assist in production. The video shows basic techniques used to treat erosion and water

quality problems in coastal watersheds. The goal is to provide landowners and the public with a good understanding of the practices used to restore their watersheds.

Garcia Watershed Project

The district received a \$100,000 grant from the California Coastal Conservancy to develop a watershed enhancement plan for the Garcia River, near Point Arena. The goal of the plan was to gather information needed to improve the resources of the river. A contract was executed to survey the watershed, collect data and analyze existing problems. A key part of the plan was to understand and respond to the needs and visions of the landowners and the Garcia River community. To do so, the RCD convened a watershed advisory group made up of members of the local community and agency technical advisors. The members, despite their different positions, agreed on a common goal of improving the salmonid fishery and came to consensus on every recommendation. The RCD was successful in balancing all of the diverse interests of landowners in a watershed so that each can support the implementation of the plan.

Recommendations were made for four basins in the watershed: the estuary, the Lower Seven Mile, the North Fork and Pardaloe Creek. In the estuary, a detailed feasibility study was proposed. In the Lower Seven Mile, North Fork and Pardaloe Creek recommendations were aimed at adding structure and riparian cover to the river, and stabilizing eroding stream banks, as well as erosion control practices on roads and landings.

Russian River Watershed

The Russian River hydrologic unit encompasses 1,485 square miles of drainage area in Mendocino and Sonoma counties, bounded by the Coast Ranges. The mainstem is about 110 miles long, flowing southward from the valleys of Redwood and Potter (north of Ukiah) to its confluence with Mark West Creek, where it

turns west to cut through the coast range and empty into the Pacific Ocean at Jenner. Elevations range from sea level at the estuary near Jenner to 4,343 feet at the summit of Mt. St. Helena in the Mayacama Mountains.

In the Potter Valley area north of Ukiah, irrigated cultivated agriculture and irrigated pasturing are common. Around Ukiah, irrigated orchard and vineyard are common land uses with light industrial and three large mills associated with the timber industry.

Moving down the watershed, the Hopland area is predominantly vineyard with rangeland grazing in the areas away from the mainstem. The river then cuts through a small canyon with rangeland as the primary land use before reaching Cloverdale and more vineyards. Vineyards predominate the valley areas down to the Santa Rosa Plains. Hillside vineyard development is on the increase, replacing rangeland away from the mainstem Russian River. The Santa Rosa Plains, Alexander Valley and Healdsburg geologic subunits contain large groundwater basins, supplying water for municipal, domestic, and agricultural uses.

The Santa Rosa Plains contains a large concentration of confined animal operations, including almost 100 dairies. There are currently 29 active dairies in the Mark West Creek (Laguna de Santa Rosa) watershed. Conversion of rangeland pasture and orchards to vineyard has increased significantly in the last decade. The reclaimed wastewater from the City of Santa Rosa operated subregional municipal waste treatment facility also has resulted in conversion of rangeland to irrigated pasture and cultivated fodder crops.

The Santa Rosa Plains area is the most populated, with six incorporated municipalities and over 200,000 residents in the area (1990 U.S. Census). Two former defense sites are located in the Santa Rosa Plains along with numerous small to large industrial sites. A number of large river terrace pit-type gravel mines are located downstream of Healdsburg.

Trends in land-uses appears to be towards continued conversion of lands to vineyards (increasing onto hillsides), and continued growth of the urban areas of Ukiah, Cloverdale, Healdsburg, Windsor, Santa Rosa and Rohnert Park. Associated with that growth are active construction sites and an increase in light industrial operations. A concerted effort is being made in the Santa Rosa Plains to retain the (reclaimed wastewater irrigated crop and) pastureland type of agriculture and maintain the viability of the dairy industry. Significant conversion of pasture to vineyards has occurred in the area.

A 1996 resource directory produced by the Sotoyome RCD lists 44 separate state and local agencies and public groups in the Russian River watershed. It is not a complete list, but provides a perspective on the variety and depth of interest, regulation and concern in the watershed. Coordination among the groups and agencies is sporadic at best, and often prompted by immediate problems requiring resolution.

Efforts aimed at improved coordination and ecological restoration are scattered throughout the watershed. The involvement spans a breadth of agencies and local groups from the Corps to state agencies to local groups. Some specific efforts that are receiving attention include:

- DFG's Coastal Salmonid Restoration Program.
- Corps' ecological reconnaissance survey.
- Federal Endangered Species Act Section 7 consultation with the Sonoma County Water Agency and the Corps regarding operation of the dams.
- Sotoyome RCD's watershed stewardship efforts and Fish Friendly Farming incentive project that focuses on a profit incentive program for farmers who meet environmental goals beyond regulatory ones.
- City of Santa Rosa's dairy waste management grant program.

- North Coast Regional Board's watershed planning approach for water
- quality (this is a grassroots effort that includes volunteer monitoring).

Each of those efforts is aimed at achieving specific goals, while consistent to varying degrees with the broader goal of salmonid protection and restoration. However, there is a pressing need to improve coordination and cooperation to avoid duplication and assure that individual actions are consistent with a broader mission. Likewise, there is a need to ensure that other watershed activities are not at cross-purposes with the restoration goals.

Agencies are considering a process to first bring together the multitude of agencies with the public to develop a management plan for the Russian River watershed that builds on existing stewardship programs and fosters additional local efforts. That process includes broad goals that are inclusive of the various local perspectives in the watershed, recognizing that actions have to be specific within the broad goals, blended only to the extent needed to avoid duplication and promote complementary efforts.

The broad goal of that effort could be to protect, restore and enhance the environmental and economic values of the Russian River watershed by supporting and assisting the development and implementation of community-based watershed stewardship plans. Specific objectives might include: protect, restore and enhance watershed health; provide certainty and predictability to the regulated community, local watershed groups, stakeholders, and the public at-large; provide a basis to satisfy the regulatory mandates contained in the ESA and CWA.

Such an effort would require state and federal entities to coordinate and commit to foster and support community-based watershed management activities within the Russian River watershed. Additionally, assurances that technical and financial resources are delivered in a coordinated fashion to community-based groups, such

as local governments, RCDs and CRMPs would be necessary so that they may fulfill their local objectives within the context of the various state and federal mandates. Such a program could be flexibly structured to ensure both needed watershed level efforts and to provide the latitude to address problems at local or sub-watershed levels. For instance, the program could develop baseline information and watershed assessments, provide a coordination mechanism, promote efforts that will attain goals consistent with the overall watershed goals, and foster opportunities for partnerships.

If such an effort is to work, however a significant level of acceptance at the local, regional, state and federal levels is needed, along with a firm commitment from the agencies and the community to coordinate, collaborate and cooperate as a team.

In response to requests from community interest groups within the Russian River watershed, the Secretary for the State Resources Agency appointed the Director of the Department of Conservation to lead a team to assist local government and other interested parties in the restoration, protection and enhancement of the watershed.

The team's mission is to:

- Better coordinate the state's actions to ensure the timely, efficient and responsible delivery of resources to the community-based effort.
- Ensure that the state's actions in the watershed are coordinated with actions of local and federal governments.
- Respond to, support and respect the needs and rights of local governments and interested parties in the community.
- Support and substantively contribute to the development of a local/state/federal cooperative Russian River Watershed Stewardship Program which will provide certainty and predictability to the regulated public, address

community needs, and protect important natural resource values which will result in meeting the regulatory mandates in the state and federal ESA and CWA.

The team will be composed of representatives from the Resources Agency, California Environmental Protection Agency, California departments of Food and Agriculture, Forestry and Fire Protection, Conservation, Fish and Game and Water Resources, Coastal Conservancy, California Energy Commission, State Lands Commission, State Water Resources Control Board, North Coast Regional Water Quality Control Board, and others as determined appropriate. The Governor's Watershed Protection and Restoration Council (WPRC) will consider this program a pilot project for an integrated approach to watershed protection, restoration and enhancement, and the team will report to the WPRC on its progress and resource needs on a regular basis. The WPRC will review and approve a timetable and benchmarks for 1998 by which the team's progress will be gauged.

Santa Cruz County Watersheds

The Santa Cruz RCD is involved in several watershed projects in Santa Cruz County. These are primarily degraded urban watersheds with erosion, exotic plant species and water quality problems.

The Soquel Watershed Project

A CRMP council has been meeting monthly since 1994 to develop a Soquel watershed plan. Activity has been focused on public education and stream bank protection. The RCD received a \$5,000 Coastal Conservancy grant to fund a workshop for volunteers to train them in monitoring stream conditions.

San Lorenzo Caretakers

This project includes 90,000 acres of an urban watershed under the guidance of a three-year old RCD-initiated CRMP. The RCD held its second annual French Broom cleanup day. Community volunteers were

organized by the RCD to "weed" French broom, an invasive, introduced species, from the watershed. The RCD then worked with DFP to have the French broom collected and a "burn day" authorized for its disposal. The RCD awarded prizes to groups bringing in the most French broom. This project was highly successful locally, attracting a lot of press and raising community ownership in the care of the watershed.

Arana Gulch Watershed

In January the RCD held a public meeting to form a CRMP council, attended by more than 50 interested people. At the meeting issues were identified and priorities set. A "Get to Know Your Watershed" meeting was held, co-sponsored by state and local agencies that have been contacted by the RCD.

Corralitos Valley Creek

This watershed project was initiated by the RCD by using an existing community group, the Corralitos Valley Community Council. Through the council, the RCD sponsored a creek cleanup. The project made a huge impact on community awareness when it placed the mountain of collected debris in the middle of town for all to see what comes out of the community's creeks.

This group has also put together a 50-page land user's guide addressing property protection issues (erosion control, earthquakes, stream care, fire hazard reduction, flooding, emergency preparedness). A community workshop will be held later this year.

Pajaro Watershed Project

The main issues in the Pajaro Watershed are fish habitat, erosion and sedimentation, wildlife habitat and water conservation. The RCD has held an initial public meeting with 350 people in attendance to address the issues affecting the watershed. This project, as well as the RCD's other CRMPs, is starting out small, slowly adding projects as volunteers and money become available. One of the RCD's goals for this, as well as

all of their CRMP groups, is to give opportunities to all stakeholders to be involved and feel a sense of ownership in their communities' creeks and watersheds.

The county has been so impressed with the RCD's watershed projects that it redirected \$38,000 from fire service and allocated it to the RCD to expand this work. The money provided a part-time watershed coordinator position that has since obtained four grants for education, outreach and on-the-ground projects.

Eel River Watershed

The Eel River is the third largest producer of salmon and steelhead in California. Many of the most dramatic changes and watershed disturbances to this river have occurred within the last 50 years. Salmon and steelhead abundance has been declining throughout this century. Most of the long-term reduction in salmon and steelhead numbers is attributable to loss or degradation of habitat caused by human activities. Land and water development projects including logging, mining, road construction, dam construction, grazing, cultivation, residential development, urbanization and water diversions have directly or indirectly reduced or adversely altered habitat conditions for salmon and steelhead. For many local observers, most of the changes have appeared to be gradual throughout this century. However, the devastating floods of 1955 and 1964, and prolonged drought from the mid 1970s through 1994 have led to an increased awareness that salmon and steelhead population numbers are at alarmingly low levels. Low population levels result in loss of resiliency necessary for fish populations to maintain healthy numbers when challenged with severe natural events.

Three general groups of problems contribute to salmon and steelhead population declines in the Eel. Problems can be classified as general problems common to the basin that have contributed to the reduction of salmon and steelhead for decades; problems that are more localized in impact and have

occurred more recently; obstacles to solving problems, not directly related to salmon and steelhead declines, because of missing or deficient information or organization to ensure wise watershed use and fishery restoration success.

Long term/general watershed problems:

- Excessive watershed erosion.
- Degraded stream and riparian habitat
- Water diversions causing low stream flows.
- Water diversions causing low stream flows.
- Poor migration access for adults and juveniles.

Recent/localized problems:

- Poaching
- Pollution.
- Predation by Sacramento squawfish

Obstacles to developing or implementing solutions:

- Need for scientific information, and evaluation and monitoring of proposed solutions.
- Need for enhanced communication and awareness of watershed management issues among all stakeholders.
- Need for additional funding and trained personnel to successfully implement solutions.

In order to address the issues within the Eel River Basin, DFG established a basin planner position in 1991 to live in the basin and work with the landowners. DFG's work in this basin is an example of a "landowner by landowner" approach to addressing issues. To date, the program has been explained to over 2,000 landowners and over 1,800 landowners have granted permission to survey their streams and plan restoration projects. Additionally, an ongoing series of public forums and workshops, most notably "Eel Swap" which involved over 200 people on March 25, 1995, have been held to solicit ideas and concerns from the basin's landowners and

managers, and other interested citizens and groups. This information, along with field assessment data, was used to form the Eel River Action Plan.

The Eel River Action Plan provides specific actions to address problems. Fishery and watershed information was integrated with observations and concerns from citizens and basin stakeholders. This provided the assessment of present conditions, identification of current problems and recovery opportunities related to Eel River salmon and steelhead resources. The elements of this plan address salmon and steelhead problems throughout the Eel River basin.

The primary goals of the action plan are: (1) halt the long-term decline in salmon and steelhead populations within the Eel River, and (2) significantly increase those populations above current levels. Dedicated efforts should improve watershed and stream conditions to a level that can be maintained on a long-term basis, on the basis that full watershed stewardship is adopted by landowners and resource users.

Efforts to improve fisheries in the Eel River system have provided many valuable lessons. One of the most important is that cooperation between agencies and private landowners is essential to any successful project. Eighty-six percent of the Eel River watershed is held in private ownership, and without the cooperation of the landowners and their managers, meaningful fishery restoration or enhancement program is not possible. Currently, cooperative programs within the Eel River involve the RCDs in Mendocino and Humboldt counties, a DFG Basin Planning Project, a DFG Salmon Restoration Project, and DFG Regions I and II.

The key to building the trust and cooperation these programs require is to eliminate fixing blame, mutually acknowledge existing watershed and stream problems, mutually develop proposed solutions, and commit to implementation and evaluation of selected projects. Once the various participants

have invested energy in a fisheries enhancement project or program, protection and monitoring of streams and watersheds become much easier.

There is a difference between the goals of restoration and enhancement. Restoration seeks to raise fish production and populations in an affected salmon or steelhead stream to the levels that occurred naturally. By contrast, enhancement seeks to improve on existing conditions, independent of previous factors that affected the fish population or habitat. Both approaches seek to raise fish populations as an objective and require ongoing maintenance and watershed protection from adverse land uses in order to endure and to be effective.

DFG has operated a salmon and steelhead restoration grants program since 1980. Each year DFG issues an RFP to the general public soliciting salmon and steelhead restoration proposals. Since 1981, nearly \$5 million, \$300,000 per year on average, has been spent in the Eel River basin by the grants program. This has supported over 230 individual projects, many of which had matching support from landowners or interested parties. Although many good projects have made measurable improvements for the fisheries, populations have increased only fraction of past population levels.

Another fishery program important to the Eel River is DFG's Salmon Restoration Project, headquartered at the Fortuna CCC Center. This program has operated in the Eel River since 1980, as well as throughout the North Coast and has improved over 300 miles of tributary habitat with instream structures, bank stabilization, and tree planting in near-stream areas.

Information and guidance for interested parties is available from several sources. Several landowners have conducted watershed or stream assessment surveys on their lands. DFG's Basin Planning Project, based in Redway, has developed an extensive collection of tributary surveys during the past five years. Over 250 Eel

River tributaries are included and involve watershed and stream inventory, analysis of the inventory, and general restoration planning for the stream. Additionally, habitat survey documents are available to guide citizen or landowner involvement and education on a stream-by-stream basis.

Habitat survey reports are useful as an initial approach to a particular stream of interest in a restoration effort. DFG and some of its contractors have been using them since 1992 to aid in planning and implementation. The reports present information that can help screen tributaries and river reaches for project activity. Some report items useful for restoration planning and project ranking include: fish species present and past; channel types; stream habitat inventory and resultant recommendations; access for personnel and equipment; landownership and management. The reports can also reflect watershed conditions, but should be augmented with field survey work to determine watershed stability prior to stream project planning. One caveat; the degree of cooperation and support from landowners and managers needs to be determined before committing resources to a particular project.

The most extensive cooperative fishery program in the Eel River involves DFG and Pacific Lumber Company (PALCO). It has been in existence since 1991 and is located on PALCO lands in the lower mainstem Eel and the Van Duzen rivers. The program used stream reports extensively in project planning and implementation efforts. This program uses all the project options mentioned above to work towards the objective stated in the program's Letter of Understanding: "To protect, enhance and restore the anadromous fishery resources within the streams and watersheds of PALCO ownership."

Eel River Salmon Restoration, a nonprofit contractor, has conducted restoration work in cooperation with DFG and landowners since 1983, mostly within the South Fork Eel River watershed. It has operated a natal Chinook salmon hatchery project and undertaken instream, riparian, watershed,

and educational projects as well. It has also assisted the Garberville Rotary Club in the past with the propagation of steelhead and coho salmon. This group has also extensively monitored selected South Fork tributaries.

The Salmon Restoration Association, from Fort Bragg, has operated an egg-taking station on Hollow Tree Creek (South Fork Eel) since 1979. In 1984-85 the group and DFG expanded the operation to include a small hatchery facility capable of rearing in excess of 200,000 salmon smolts. Releases from the operation since 1979 total approximately 823,000 Chinook fry. In three years over the period of operation, small lots of coho salmon and steelhead trout eggs were taken at the Hollow Tree operation.

In Hollow Tree Creek, on lands primarily owned by Louisiana-Pacific Corporation, the CCC under DFG supervision has conducted extensive habitat improvement work since 1980. The Center for Education and Manpower Resources (CEMR) has also contracted with DFG to carry out habitat projects in this drainage. This work has benefited the Chinook and coho salmon, and steelhead trout that use Hollow Tree Creek, and has provided better conditions for populations enhanced by operation of the hatchery facility.

In the upper mainstem Eel, DFG has operated an egg collecting station at Cape Horn Dam, which contains Van Arsdale Reservoir, for most of this century. Over the years, eggs collected have been widely distributed in the Eel and Russian river systems. Although most eggs were from steelhead trout, some Chinook eggs were taken as well. Records of fish counts associated with the operation of the egg-taking station reflect dwindling fish populations.

DFG is presently conducting a program of rescuing wild steelhead and Chinook salmon in the mainstem Eel River above Cape Horn Dam. Through this program, Chinook salmon and steelhead are reared to smolt size prior to release to reduce predation by Sacramento squawfish. The program concept is that larger, emigrating juveniles

are not as susceptible to predation as smaller, naturally reared juveniles are. This program is scheduled to continue until 1,000 adults of each species are annually counted at the Van Arsdale Fish Facility or until the year 2003.

Cape Horn Dam is part of Pacific Gas and Electric (PG&E) Potter Valley Project. This power generation project includes Lake Pillsbury, contained by Scott Dam 12 miles above the powerhouse diversion at Van Arsdale. About 160,000 acre-feet of Eel River water are diverted annually through PG&E turbines. Tailwater from the powerhouse is discharged into the East Fork of the Russian River. The project was put on-line in its present form in 1921. Since 1983, PG&E and its contractor, Steiner Environmental Consulting (SEC), have conducted extensive fish and habitat monitoring in the upper Eel River. Restructuring of the project operations is a future possibility. In this event, a renegotiation of diversion rates is likely.

Pilarcitos Creek – San Mateo County

The Pilarcitos Creek Watershed is in coastal San Mateo County in Central California. The watershed consists of steep, forested headwaters that drain down into a valley floor where the predominant land use is agriculture. The tributary streams support industrial facilities such as the landfill and a rock quarry, as well as agriculture and parklands. Most of the land making up the headwaters is owned by San Francisco Water Department (SFWD) and managed as a drinking water supply. The area is mostly pristine but contains two on-stream reservoirs that prevent anadromous fish migration. The valley floor supports Christmas tree, pumpkin and flower growers and in most cases utilizes land right up to the bank of Pilarcitos Creek, allowing for a very small riparian zone. The largest tributary, Arroyo Leone Creek, supports row crop agriculture and scattered homesteads. The California Department of Parks and Recreation owns and manages most of the land within the Mills Creek watershed, the

largest tributary to Arroyo Leone Creek. The city of Half Moon Bay lies at the mouth of Pilarcitos Creek at the Pacific Ocean.

The watershed has historically supported a steelhead population and possibly a coho salmon population. California red-legged frogs are also found in this watershed. Overall, the condition of the habitat within Pilarcitos Creek is severely degraded. The reach within the valley floor contains some pools and virtually no spawning habitat. Most of the watershed consists of decomposed granite, a highly erodible soil that has become the bed of Pilarcitos Creek through most of its course. The upper watershed on SFWD property contains good habitat from below the lowest reservoir to the valley floor. Mills Creek and upper Arroyo Leone Creek contain good habitat although there are various migration barriers on both streams.

In October of 1992, two sediment retention structures at Browning-Ferris Industries' Ox Mountain Landfill in the Corinda Los Trancos Creek watershed, tributary to Pilarcitos Creek, failed. The failure resulted in the discharge of sediment to Pilarcitos Creek which in turn caused aquatic habitat degradation. The Regional Board and DFG initiated enforcement action for violations of NTDES permit requirements and Fish & Game Code. A settlement agreement was reached; part of the agreement called for establishment of a \$900,000 Pilarcitos Creek watershed restoration fund. In 1994, an additional \$200,000 was added to the fund for a total of \$1.1 million available for restoration efforts. The fund is being used to implement various programs and projects that provide for improved watershed conditions.

Once the restoration fund was established, the agencies agreed that first and foremost a public advisory group must be formed in order to solicit input from landowners, local agencies and local special interest groups regarding the focus for restoration efforts. The agencies not only decided that it was important to have such a group, but that it was important that the members have a real voice in the decisions made regarding use of

the restoration fund. Hence, the Pilarcitos Creek Advisory Committee (PCAC") was formed. Most, if not all, decisions are brought to the PCAC first for review and discussion. The members vote and the majority decision is submitted to the agencies as a recommendation. The agencies then make the final decision. The agencies have agreed that they will not override or veto a PCAC recommendation unless implementation of the recommendation will result in a violation of law, it is grossly negligent or in error. In other words, the agencies have agreed to comply with the wishes of the well-informed community, instead of forcing the community to comply with its wishes. The commitment to, relationship by the agencies is the primary factor in the success of the project thus far. The agencies have credibility and the trust of the community and, as a result, are able to work with landowners and community leaders to implement projects on private property (most of the watershed is in private ownership).

Working with the PCAC, the agencies identified restoration priorities based on a restoration plan that was prepared by a third party consultant. Removing fish barriers, increasing stream flows, and restoring habitat features in selected reaches are the highest priority projects. In addition, funds have been set aside for "walk-in" projects for landowners who have stream related problems and need assistance through cost-share or technical information. Project implementation began in 1996 and will continue through 2001. The San Mateo County RCD has contracted to oversee implementation. To date, the following projects have been completed or are in progress:

- Stream bank stabilization demonstration project.
- Stream Maintenance Certification Workshop for landowners to demonstrate riparian zone management tools conducted.
- Stream care pamphlet prepared.
- Drip irrigation and filtration system for local nursery installed.

- Fish migration barrier removed and channel restored on Mills Creek.
- Watershed monitoring project with Half Moon Bay High School initiated.
- Hydrological study for entire watershed initiated.
- Prepared design and obtained permits for various stream improvement projects slated for next spring.

Eventually, all impassable fish barriers will be removed. This will result in an increase in available habitat for anadromous fisheries. Also, the project hopes to provide more water and sustained flows to support migration and rearing in the Pilarcitos Creek mainstem. Concurrently, the project will continue to provide assistance to landowners and continue to build upon the cooperative relationship that has been established.

Mill, Deer Butte and Battle Creeks

Restoration efforts on Mill, Deer Butte and Battle Creeks have been significant. Several local groups have been formed to help in these efforts. These creeks are important to spring-run salmon which is being considered for listing under the Endangered Species Act. A special report was prepared by DFG to the Fish and Game Commission in February 1996 on the status of actions to restore Central Valley spring-run Chinook salmon. This report is included as Appendix H and can be obtained separately from DFG (916)653-6194.

Ventura River Watershed

A group of local public and private agencies with responsibilities for surface water, groundwater, flood control and other public works facilities, have collaborated to develop a single management plan that can be used by all local agencies to address protection and restoration of steelhead populations in the Ventura River. These agencies include: the Casitas Municipal Water District, city of San Buenaventura, Ventura County Flood Control District, Ventura County

Transportation Department, Ventura County Solid Waste Management Department, Ojai Valley Sanitary District, Ventura River County Water District, Ojai Basin Groundwater Management Agency, Miners Oaks County Water Districts and Southern California Water Company. The Los Angeles Regional Water Quality Control Board has monitored the progress of this effort, attended meetings and provided comments on work products.

A public process was used to develop a Draft Ventura River Steelhead Restoration and Recovery Plan (draft prepared by Entrix, Inc., Walnut Creek, California, on July 24, 1997). Input was solicited from local and state resource agencies, environmental groups and other interested members of the public. The draft plan has been reviewed and comments have been received from the agencies involved and other stakeholders in the area. The final plan is in preparation and should be available by the end of 1997.

The objectives of the Ventura River Steelhead Restoration and Recovery Plan are twofold: to identify measures to mitigate impacts of ongoing operations and maintenance activities of future projects; and to identify and evaluate opportunities to promote recovery and restoration of steelhead in the watershed.

The plan will consider a wide range of conservation actions that can be implemented by public agencies with facilities and interests in the watershed, as well as other interested individuals, groups, or resource agencies. Conservation actions will be ranked based on biological effectiveness, feasibility and costs. The plan identifies several applicable routine maintenance activities and best management practices, which can be implemented by each agency as mitigation measures to avoid or minimize impacts to steelhead populations. The plan also screens and ranks potential conservation actions to protect and restore steelhead populations, which helps to eliminate impracticable actions from further consideration and allows development of a prioritized list of actions to assist the sponsoring agencies and other interested parties in developing an implementation

strategy. The plan also discusses the biological benefits anticipated from implementation of each conservation action. The final Ventura River Steelhead Restoration and Recovery Plan will present recommendations for implementing conservation actions that would have meaningful benefits to steelhead populations in the Ventura River. The recommendations include actions that could be implemented in the near term, as well as actions requiring a longer time frame. Some actions require prior or simultaneous implementation of other actions to realize the expected benefits. For some of the more expensive and complex measures, it may take a long time to secure funding, prepare design specifications, or demonstrate some aspect of feasibility. In these cases, interim measures or pilot projects have been suggested that can expedite achievement of benefits or remove uncertainty associated with some aspect of implementation.

The Regional Board will continue to work with the local agencies and other interested stakeholders to implement the recommendations of the plan to the extent practicable. The Regional Board developed a regional water quality-monitoring program in 1996 as part of the watershed approach to permitting discharges within the Ventura River Watershed. The Regional Board also plans to help develop a long-term monitoring program to assess the overall success of the measures implemented.

CHAPTER VI

MONITORING

Introduction

The protection and restoration of environmental resources is a continuous process. One key component of this process is the ability to check progress against benchmarks to see if you are on the right path and making progress towards your goal. Protection and restoration of environmental resources often do not have immediate, observable results and require a monitoring program to provide feedback to ensure programs are effective and progress is being made to reach goals.

The process of taking corrective actions or changes to the protection and restoration programs, or to the monitoring itself that result from this feedback is often called "adaptive management." Environmental monitoring can be expensive and a monitoring program needs to be directed at answering specific questions to keep the program focused and the costs reasonable.

This section begins the discussion on the monitoring needed to accompany the Watershed Protection and Restoration Council's (WPRC) directed efforts to protect and restore California's anadromous fish resources. It will be further developed and refined over the next several months as the Science Committee makes recommendations. The discussion is separated into the following sections:

- 1) questions to be addressed by the monitoring program
- 2) conceptual models
- 3) types of monitoring

- 4) institutional aspects of monitoring
- 5) existing fishery and flow-related monitoring
- 6) water quality monitoring
- 7) recommended tasks in refining the monitoring program.

An integrated monitoring and research program should be characterized by:

- Explicit, quantifiable, restoration goals;
- Use of models to link physical and biotic ecosystem processes and functions;
- An integrated and statistically significant monitoring program based on testable hypotheses;
- Improved emphasis upon ecological function;
- Creation of a standing science organizational body to link scientific understanding to management practices.

Many institutions, such as universities and government agencies, are involved in monitoring and applied research that could contribute to the design and assessment of ecosystem rehabilitation programs discussed in this report. However, the scope, coverage and coordination of existing monitoring and applied research are fragmentary. When viewed together, these programs do not provide a coherent, overall picture of what is being monitored, how the environment is changing over large spatial or temporal scales, or a clear sense of how the monitoring data could be converted to information to be used by resource managers and decision-makers. The lack of

coherent and complete coverage is especially important because the geography of this ecosystem is complex, as are the associated physical and ecological processes. This combines with the variety of ways possible to ask the same question and differing focus of researchers conducting studies. Most research is conducted in an independent fashion and is not known to others until it is published.

Questions to be Addressed

Monitoring programs need to address the management questions that are being asked or will be posed in the future. The key is to develop and refine these questions and to make sure the monitoring stays on track to answer them in the most cost-effective means and be as credible as possible. Some key questions that a monitoring program for the WPRC need to address and the type of monitoring to address them include:

- 1) Is reasonable progress being made toward achieving the goal of doubling the natural production of anadromous fish? (Trend Monitoring)
- 2) Is water quality and habitat adequately protected and is reasonable progress being made to support natural anadromous fish production ? (Trend Monitoring)
- 3) What factors in each watershed limit anadromous fish production and require protection of beneficial uses? (This is a
- 4) baseline evaluation or a research question.)
- 5) Are the projects or programs that are implemented to improve factors affecting fish habitat and production and water quality being implemented as proposed? (Implementation Monitoring)

- 6) Are the mitigation measures, projects or programs that are implemented to improve factors affecting fish habitat and production and water quality effective? (Effectiveness Monitoring)
- 7) Are mitigation measures installed as required? (Compliance Monitoring). Are narrative and numerical water quality criteria achieved at the point of discharge and in the ambient water body. (Effectiveness Monitoring)

Conceptual Models and Key Indicators

A host of monitoring and focused research questions could emerge from the above questions. These sub-questions depend on the sophistication of the conceptual model predicting how the ocean conditions, physical watershed system, biotic environment and fishing pressure interact to result in anadromous fish production. On the landside of these questions, the interactions among the natural processes and human induced changes in the watershed affect the beneficial uses in the watershed. Chapter 2 discusses how these factors affect the survival and production of anadromous fish. Factors such as the effects of introduced species and the effects of fishing pressure must be included in the models along with watershed factors. If the conceptual model is wrong, then the corrective actions may be ineffectual and the monitoring program may be focused on the wrong components of the environment. These conceptual models often include a judgment on which factors are the most important in affecting beneficial uses and the thresholds for when factors become controlling. Therefore, a Science Committee review of available systems models is important during the development of the monitoring program.

During the process of model review, key indicators or bench marks should be selected to help measure progress towards

the goals of resource protection and restoration. The key indicators must be linked as closely as possible to the goals but should also be factors that are measurable over time. For example, measures of population size at various life stages or the level of various sources of mortality can help in understanding changes in production. These indicators are then monitored over time to determine progress towards the goals.

The further away the key indicator is from the direct measure of beneficial use the more dependent one is on the correctness of the conceptual models. For example, a measurable key indicator for fish protection is suitable habitat. Many programs are intended to improve or protect certain key habitat values. The assumption is that, "If we build it (or at least protect it) they will come." However, this is not always the immediate case. There are many examples where the wrong type of habitat was targeted or the habitat was simply not used by fish to the extent predicted. While habitat restoration is important, a measure of the actual biological response is essential to ensure that the intended results actually occur. Sometimes, fish must be reintroduced into watersheds to produce results; this has genetic and disease implications which must be considered.

Types of Monitoring

The types of monitoring set forth below are derived from McDonald, et al., (1991).

Trend Monitoring

Trend monitoring is the monitoring of long-term changes in key indicators or conditions. It includes changes in population sizes over time or long-term changes in key factors that directly indicate progress towards meeting the management goals. It can also include evaluations at the key points in the watershed where you can most feasibly and reliably understand the effects of changes in the watershed. It is the type of

monitoring that provides accountability at an appropriate temporal and spatial scale measuring progress toward meeting the desired future conditions and management goals. It should be as quantitative as possible to give statistically supportable answers to management questions.

Trend monitoring also includes keeping track of the changes in those factors that are most likely associated with changes in key indicators. Management questions include answering "why" things have changed, not only "when" they have changed. Knowing why things have changed allows the adaptive management process to work. For example, if changes in river flow and changes in physical habitat are expected to be associated with anadromous fish population changes over time, then monitoring these factors should be included in the trend monitoring program. One aspect of trend monitoring is the establishment of a good baseline, discussed below.

Baseline Monitoring/Assessment

Measuring progress towards meeting the management goals is problematic without knowing or "bench marking" where you started. The baseline assessment need to be based on factors that, if tracked, can show long-term trends. These factors should not be so affected by daily or seasonal events that long-term trends are meaningless. Watershed assessments also provide a description of the habitat types in the stream system, sources of sediments and other pollutants and a general understanding of the watershed system. These assessments can highlight areas of concern and are useful in prioritizing the next steps to be taken to address these concerns. This often includes corrective actions and then more detailed monitoring. The use of local watershed groups and other volunteers to perform this and other

Types of monitoring is discussed in later sections.

Implementation Monitoring

Implementation monitoring is intended to determine whether and to what degree an activity or project was carried out as planned, specified or required. Implementation monitoring is usually done only once for specific project activities, but for longer-term projects, it is needed to check the progress over the course of several years.

Implementation monitoring is typically carried out as an administrative review and does not involve any water quality measurements. It is often the most cost-effective means to reduce pollution or protect beneficial uses because it provides immediate feedback to the managers on whether the process for implementing specific practices is being carried out as intended. On its own, however, implementation monitoring cannot directly link management activities to water quality or the protection of beneficial uses. The implementing group assumes that these benefits will come. However, whether they actually do accrue is an issue for effectiveness monitoring.

Effectiveness Monitoring

Effectiveness monitoring is intended to determine whether and to what degree any specified practice achieved its immediate objectives (i.e., did it do what it was supposed to do?). Evaluating individual practices may require detailed and specialized measurements that are best made at the site of, or immediately adjacent to, the management practice. Effectiveness monitoring often occurs outside of the stream channel and riparian area, even though the objective of a particular practice is intended to protect the designated uses of a water body. For example, in the case of sediment, effectiveness monitoring determines how much sediment was eroded

on the hillside, not how much got into a stream.

Effectiveness monitoring is also applied to determining how well mitigation measures are working.

In areas where sediment entering a stream is quickly carried away (i.e., areas with bedrock channels and/or steep gradients), little evidence of sedimentation may remain to be observed or measured. In such situations, effectiveness monitoring may provide the closest feasible approximation of changes to instream conditions.

Monitoring individual practices is quite different from monitoring to determine whether the cumulative effect of all the practices used in a project results in adequate water quality or beneficial use protection. Sometimes called “project monitoring,” this aspect of effectiveness monitoring usually is done in the stream channel or on instream uses. It may be difficult to relate these measurements to the effectiveness of individual practices, because the beneficial use or water quality factor is a function of more than the effectiveness of the practices associated with a project.

For many management practices, effectiveness monitoring measurements made outside of the stream channel will be needed to provide the sensitivity needed to evaluate the practice, because they are less subject to confounding factors than instream measurements. However, in the final analysis, the effectiveness of the action on protecting instream values is the true test of whether the action has been effective. To eliminate changes due to other factors, this kind of monitoring typically requires use of a control stream reach, the hydrologic and biologic conditions of which are very similar to the reach being monitored in the vicinity of the project. Often the control reach is located just upstream of the project. In some cases, such as a fish habitat improvement

project, the comparison may be on a before and after basis.

Validation Monitoring

Another aspect of effectiveness monitoring is validation monitoring. Validation monitoring is intended to determine whether and to what degree the changes observed or measured in one or more factors of interest within a watershed or water body correspond to those predicted by a hypothesis or by a process model. For example, the conceptual models discussed above provide inferences about the causal linkages between the various factors and the effects on beneficial uses. These inferences can be tested through validation monitoring. This type of monitoring is sometimes lumped into effectiveness monitoring because it provides a test of whether the theories on the effectiveness of certain actions actually validate in the field.

Compliance Monitoring

Compliance monitoring is used to determine if a mitigation measure is being used or to determine whether and to what degree specified numerical or descriptive water-quality objectives or standards are being met. Often, the regulations associated with an individual standard or mitigation specify the location, frequency and method of measurement.

Quality Assurance and Quality Control

Quality assurance (QA) and quality control (QC) are crucial for ensuring the accuracy and reliability of monitoring results and confidence in the information, especially for quantitative monitoring or monitoring done by diverse groups. QA/QC elements should be incorporated into initial program planning. However, as personnel changes and the program matures, these important elements often receive less attention. A QA/QC program will vary, depending on the program

assurances needed and the degree of control available over the monitoring project. A QA/QC program can add credibility to a monitoring result even if the project does not have other oversight controls.

The Q/A component usually includes detailed objectives, reference materials, a training program, minimum personnel qualifications, and project protocols. The Q/C component comprises procedures to detect and correct errors and omissions. This program should be able to identify problems or inconsistencies and their source, implement action to correct them, document results of corrective action, and continue the process until each problem is eliminated. Q/C checks on the procedures and the field personnel should be done periodically during the field season. Internal Q/C checks can include replicate samples at stations to check consistency of collection and repeat field collections by separate crews. If any problems are found, corrective action can then be developed.

Information -- Interpretation of Data

Monitoring programs develop data. The key is turning this data into information that answers specific questions for decision-makers and the public. The classic steps in this process are: (1) collect data, (2) analyze data for information about the question, (3) determine if this information is useful for management decisions, (4) apply management using the new understanding gained, and (5) continue to test management applications and validate the new assumptions. A successful program leads to an understanding or "knowledge" of how management decisions should be made in order to have a successful outcome for a target goal. One critical aspect of any monitoring program is the sharing of data between different groups and developing reports that makes information and knowledge available to interested parties. Due to the diversity of the data collected by WPRC agencies, a set of distributed data bases with ties (meta-data) to each other

would be more valuable than any single data base. The steps needed to allow better data and information exchange is discussed in later sections.

Institutional Aspects of Monitoring

Perhaps the most difficult aspect of monitoring programs is developing the institutional framework and funding to implement a cohesive long-term monitoring effort. In California there are few successful long-term monitoring efforts of the scope and interagency nature needed by the WPRC. One effort is the discharger and ocean monitoring conducted by the South California Coastal Water Research Project (SCCWRP) in the Santa Monica Bay area near Los Angeles. This is a consortium of dischargers who have pooled their resources to conduct both discharger and long term trend monitoring of the regional effects of pollutants. It has been in place for over 20 years and has collected good long-term data on all the types of data set forth above.

The second effort is the Interagency Estuary Project (IEP) for the San Francisco Bay Sacramento San Joaquin Delta Estuary. A similar, but broader-based program was initiated in 1993 for San Francisco Bay the auspices of the San Francisco Estuary Institute (SFEI). The IEP effort is a \$12 million a year program that integrates the monitoring and research of nine separate state and federal agencies that have water resource, biological resource or water regulatory functions in the Bay and Delta. The IEP has been in place for over 25 years and has the best long-term comprehensive ecological data set on the West Coast and perhaps the nation.

The factors in common with all these programs are: (1) as their funding base are the requirements of regulatory agencies that require monitoring as conditions of either waste discharge or water right permits; (2)

the permittees realize that environmental monitoring is a necessary business expense that in the long term is helpful to address future environmental issues; and (3) state and federal agencies either actively integrate their efforts with these groups or recognize their scientific credibility.

Typically, monitoring programs funded solely by a state or federal agency have not been successful in providing the type of long term data that will be needed by the WPRC agencies in the future. Budgetary shifts as priorities change and the tendency of monitoring programs to loose focus on specific management questions often leading to the unraveling of a stable funding base. The key is to develop a partnership between state, federal, regional, and local agencies and groups to coordinate resources and efforts into an effective set of monitoring activities with the common goals of developing and sharing information and changing the monitoring question when needed.

Volunteer Monitoring

Volunteer monitoring can be a very important source for data gathering. Local watershed groups and educational programs are extremely interested in keeping track of change in their area. A survey conducted in 1997 found 55 volunteer monitoring groups in California that are currently conducting monitoring and another 12 groups that indicated they would like to start such a program. Most groups are monitoring creeks and rivers. However, ocean waters, bays and estuaries are monitored as well. A publication titled "California's Directory of Volunteer Monitoring Organizations" is available from the State Water Resources Control Board's (SWRCB) nonpoint source program. These community-based monitoring efforts are based on unbridled enthusiasm and the knowledge of local fish, amphibians, birds and plants. These volunteers may often have more knowledge on the health of their creeks and watersheds than anyone else. They also are close to local issues. They can mobilize

staff-intensive, time-critical monitoring efforts faster than state or federal agencies. The key is providing these groups with guidance on sampling techniques, protocols, data storage and retrieval and to integrate their efforts into the overall-monitoring scheme.

Monitoring Program Management

One of the major tasks for the WPRC is to recommend a strategy for managing the coordination and integration of the state, federal and local (volunteer) monitoring efforts. At present, there is no agency or interagency structure to manage such an extensive program. Given the large number of federal, state and local organizations that could be involved in such an effort, a multi-agency umbrella monitoring/research management group reporting to the WPRC Working Group or Policy Group could be effective. However, a more complex structure involving regional coordination of local watershed groups is essential. Since the issues which need monitoring programs are water quality, fish populations and watershed function for fisheries. Both the Department of Fish and Game (DFG) and Regional Water Quality Control Boards (Regional Boards) sit on the WPRC Working Group; they are the logical agencies to coordinate local and regional watershed groups. The design of an effective management structure is needed to ensure that the monitoring efforts respond to the needs of the WPRC.

The WPRC needs to develop a steering committee to oversee the development and coordination of a detailed monitoring and research program. The steering committee should include:

- Department of Fish and Game
- Department of Food and Agriculture
- Department of Forestry (coordinating with Board of Forestry)
- State Water Resources Control Board

- North Coast Regional Water Quality Control Board
- Central Coast Regional Water Quality Control Board

The steering committee should develop and draft an MOU and organizational structure between the state agencies to coordinate their monitoring and research activities for the coastal watershed. The MOU should be patterned after the MOU for IEP for the San Francisco Bay-Delta Watershed. The program should include joint funding of a monitoring project coordinator with specific tasks to include organization of regular meetings among program leaders to pool their expertise and resources into a cohesive coastwide effort for monitoring and research. An annual budget of all monitoring and research activities related to watershed monitoring, fish habitat and abundance, water quantity and water quality should be prepared for approval by the WPRC. The MOU and the budget should be expanded as soon as practical to include federal agencies and local groups performing such monitoring.

Watershed groups and stakeholder parties sensitive to gaps in all the current monitoring programs are expected to play a large role in the development of the WPRC effort. A special effort must be made to include the efforts of organized groups or landowners into the WPRC monitoring program. DFG and Regional Boards' watershed coordinators would be responsible for identifying those groups that are willing to participate in a coordinated monitoring effort. Watershed group or landowner work teams could be established and their activities coordinated with the overall WPRC effort. DFG has already begun a Data Co-op effort with coastal data holders and this could be expanded.

Focus of Statewide Monitoring Efforts and Needed Funding

Monitoring the short- and long-term trends in habitat quality and quantity, water quality and flow, and fish populations are essential to demonstrate the success of the state's efforts in protecting its anadromous fish resources. These types of monitoring also are the most difficult to fund without government support.

Listed below are some of the trend monitoring projects conducted for fish populations and habitat and for flows in California and recommendations for the augmentation of each in the next few years. Proposals for water quality monitoring are being prepared by the SWRCB and Regional Boards as part of their Watershed Management Initiative.

Existing Fishery and Flow Monitoring Programs

Fishery Monitoring

Tables I, II, III and IV on the following pages provide a summary of some watersheds, streams and types of surveys conducted by DFG related to fish population and fish habitat. Tables I and II are for areas north of San Francisco and tables III and IV are for areas south of San Francisco. Tables I and III show periodic monitoring while tables II and IV show multi-year surveys. While both types of data can be used to assess trends, the multi-year sampling provides a better ongoing evaluation of year to year variation and more direct feedback on changes while they are occurring. Not all information gathering activities of the department are listed.

The surveys have been broken down into four types: (1) Habitat assessments, (2) quantitative assessments of the number of spawning adults, (3) quantitative evaluation of the number of fish out migrating to the sea, and (4) the standing

crop of young fish populations in the summer.

Habitat assessments are conducted by a standard procedure used by DFG. They can give a determination of the quality of the habitat available in a stream reach and how it is changing over time. Included in habitat quality determinations are habitat elements, water quality elements and macro-invertebrate communities. Adult spawning is typically evaluated by carcass counts for coho salmon and by counting redds for steelhead. Winter steelhead migrate during high winter flows which makes them more difficult to count because of murky water. They can be counted while they pass specially designed weirs or ladders that can withstand high flows or through trapping programs using fyke or rotary traps. These are usually very costly and are more common in the south coast areas where river flows are not as high as they are on the north coast. Out-migration population estimates also require specialized traps and are relatively rare. Summer standing crop estimates of young steelhead and coho are conducted through electrofishing or snorkel surveys. These last estimates are typically more qualitative than quantitative unless index reaches are used and depletion pass survey techniques employed.

DFG recently reviewed its fish population monitoring programs for coho and steelhead and have recommended the following tasks to augment their existing program. These tasks are:

- Assess winter steelhead adult abundance using mark recapture techniques in the Mad, Gualala and Garcia rivers.
- Establish more juvenile index reaches.
- Conduct steelhead angler surveys to assess harvest and angler use.
- Assess adult abundance in the lower Klamath River.

TABLE I. Department of Fish & Game Periodic Sampling Sites for Coastal Winter-Run Steelhead and Coho Salmon North of San Francisco Bay. Data Collected within the Last 10 years. March 1998. 1

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY 2			
				Habitat	Spawning	Out-Migration	Standing Crop ³
Van Duzen (Humboldt Co.)	Van Duzen R. Tribs.	Steelhead & Coho	374	✓			
	Lawrence Cr.	Steelhead & Coho	2		✓		
	Shaw Cr.	Steelhead & Coho	4		✓		
	Root Cr.	Steelhead & Coho	1		✓		
	Stevens Cr.	Steelhead & Coho	1		✓		
	Cummings Cr.	Steelhead & Coho	1		✓		
	Grizzly Cr.	Steelhead & Coho	2		✓		
	S.F. Yager Cr.	Steelhead & Coho	1		✓		
	Blanton Cr.	Steelhead & Coho	1		✓		
Elk River (Humboldt Co. 0	N.F. Elk R.	Steelhead & Coho	4		✓		
	S.F. Elk R.	Steelhead & Coho	2		✓		
Eel R. (Humboldt & Mendocino Co.)	Mainstem Tribs.	Steelhead & Coho	564	✓			
Eel R. (Mendocino & Lake Co.)	Mainstem & 24 Tribs.	Steelhead & Coho	26		✓		✓
S.F. Eel R. (Humboldt & Mendocino Co.)	S.F. Eel R. Tribs.	Steelhead & Coho	1184	✓			
	China Cr.	Steelhead & Coho	2				✓
	Redwood Cr.	Steelhead & Coho					✓
	Sproul Cr.	Steelhead & Coho	4		✓		✓
	W.F. Sproul Cr.	Steelhead & Coho	1		✓		
N.F Eel R. (Humboldt & Mendocino Co.)	N.F. Eel R. Tribs.	Steelhead & Coho	264	✓			
M.F Eel R. (Trinity, Glenn & Mendocino Co.)	M.F. Eel R. Tribs.	Steelhead & Coho	54	✓			

1 Additional population data has also been collected by other fishery scientists outside of the California Department of Fish & Game.

2 DFG also collects some water temperature and invertebrate data but that information is not included in this overview.

3 Could mean qualitative standing crop data or just presence or absence of species.

4 Number of tributaries in watershed that were habitat typed.

TABLE I. Continued.

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY			
				<i>Habitat</i>	<i>Spawning</i>	<i>Out-Migration</i>	<i>Standing Crop</i>
M.F Eel R. (Trinity & Mendocino Co.)	20 tribs.	Steelhead	23		✓		✓
	Black Butte R.	Steelhead	4		✓		✓
Bear R. (Humboldt Co.)	Brushy Cr.	Steelhead & Coho	2	✓			✓
	Pullen Cr.	Steelhead & Coho	1	✓			✓
	Nelson Cr.	Steelhead & Coho	1	✓			✓
Mattole (Humboldt Co.)	Thompson Cr.	Steelhead & Coho	1				✓
	Ewe Cr.	Steelhead & Coho	1				✓
	Baker Cr.	Steelhead & Coho	1				✓
Usal Cr. (Mendocino Co.)	Usal Cr.	Steelhead & Coho	2		✓		✓
Abalobadiah Cr. (Mendocino Co.)	Abalobadiah Cr.	Steelhead & Coho	1				✓
Temmile Cr. (Mendocino Co.)	& 11 tribs	Steelhead & Coho	11		✓		✓
Digger Cr. (Mendocino Co.)	Digger Cr.	Steelhead	1				✓
Russian Gulch (Mendocino Co.)	Russian Gulch	Steelhead & Coho	1				✓
Big River (Mendocino Co.)	Big River	Steelhead & Coho	1				✓
	N.F. James Cr.	Steelhead & Coho	1	✓			✓
	Two log Cr.	Steelhead & Coho	3	✓			✓
	Little N.F. & 6 Tribs.	Steelhead & Coho	7		✓		✓
	Rocky Gulch	Steelhead & Coho	2	✓			✓
	Thompson Gulch	Steelhead & Coho	3	✓			✓
	Berry Gulch	Steelhead & Coho	5	✓			✓
	Manly Cr.	Steelhead & Coho	1	✓			✓
	N.F. Big R. & 8 Tribs.	Steelhead & Coho	10		✓		✓
	Park Gulch	Steelhead & Coho	1	✓			✓
	Lost Cr.	Steelhead & Coho	1	✓			✓
	Water Gulch	Steelhead & Coho	4	✓			✓

TABLE I. Continued.

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY			
				<i>Habitat</i>	<i>Spawning</i>	<i>Out-Migration</i>	<i>Standing Crop</i>
Big River (Mendocino Co.)	Arvola Gulch	Steelhead & Coho	2	✓			✓
Continued	Chamberlain Cr.	Steelhead & Coho	2	✓			✓
	W. Chamberlain Cr.	Steelhead & Coho	2	✓			✓
	Gulch Sixteen	Steelhead & Coho	3	✓			✓
	Soda Gulch	Steelhead & Coho	3	✓			✓
	Dark Gulch (Mendocino Co.)	Steelhead	1				✓
Albion R. (Mendocino Co.)	Albion R. & 1 Trib.	Steelhead & Coho	2				✓
Big Salmon R. (Mendocino Co.)	Big Salmon R.	Steelhead & Coho	1				✓
Novarro R. (Mendocino Co.)	Novarro R. & 9 Tribs.	Steelhead & Coho	10				✓
Mallo Pass Cr. (Mendocino Co.)	Mallo Pass Cr.	Steelhead	1				✓
Irish Cr. (Mendocino Co.)	Irish Cr.	Steelhead & Coho	1				✓
Garcia R. (Mendocino Co.)	Garcia R. & 8 Tribs.	Steelhead & Coho	9				✓
Gualala R. (Mendocino Co.)	Gualala R. & 8 Tribs.	Steelhead & Coho	9				✓
Russian R. (Sonoma Co.)	7 Tribs.	Steelhead & Coho	7				✓

TABLE II. Department of Fish & Game Multi-Year Sampling Sites (Index Sites) for Coastal Winter–Run Steelhead and Coho Salmon North of San Francisco Bay. Data Collected within the Last 10 years. March 1998.¹

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY ²			
				Habitat	Spawning	Out-Migration	Standing Crop ³
Smith (Del Norte Co.)	Rowdy Cr.	Steelhead & Coho			✓		
	Sultant Cr.	Steelhead & Coho	1				✓
	Knopti Cr.	Steelhead & Coho	1				✓
Klamath (Humboldt Co)	Tarup Cr.	Steelhead & Coho	1				✓
	McGarvey Cr.	Steelhead & Coho	1				✓
	S.F. Ah Pah Cr.	Steelhead & Coho	1				✓
(Del Norte Co)	S.F. Winchuck Cr.	Steelhead & Coho	1		✓		✓
Mad River (Humboldt Co)	Cañon Cr.	Steelhead & Coho	1		✓		✓
	N.F. Mad R.	Steelhead & Coho			✓		
Freshwater Cr. (Humboldt Co)	Freshwater Cr.	Steelhead & Coho	1				✓
Van Duzen (Humboldt Co.)	Lawrence Cr	Steelhead & Coho	6	✓			✓
	Shaw Cr.	Steelhead & Coho	3	✓			✓
Eel R. (Humboldt & Mendocino Co.)	Eel R.	Steelhead & Coho	14				✓
	Bear Cr.	Steelhead & Coho	2	✓			✓
	Squaw Cr.	Steelhead & Coho	3				✓
	Cow Cr.	Steelhead & Coho	3				✓
	Canoe Cr.	Steelhead & Coho	3				✓
	Bull Cr.	Steelhead & Coho	4				✓
S.F. Eel R. (Humboldt & Mendocino Co.)	S.F. Eel R.	Steelhead & Coho	14				✓
	Pollack Cr.	Steelhead & Coho	1				✓

1 Additional Fisheries data has also been collected by other fishery scientists outside the California Department of Fish & Game.

2 DFG also collects some water temperature and invertebrate data but that information is not included in this overview.

3 Qualitative standing crop data.

4 Snorkel Survey in 70 continuous miles of stream.

TABLE II. Continued.

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY ²			
				Habitat	Spawning	Out-Migration	Standing Crop ³
	Sprowl Cr.	Steelhead & Coho	1				✓
Mattole (Humboldt Co.)	Green Ridge Cr.	Steelhead & Coho	1	✓			✓
	Oil Cr.	Steelhead & Coho	2	✓			✓
	Rattlesnake Cr.	Steelhead & Coho	2	✓			✓
Dehaven Cr. (Mendocino Co)	Dehaven Cr.	Steelhead & Coho	1		✓		✓
Wages Cr. (Mendocino Co)	Wages Cr.	Steelhead & Coho	1		✓		✓
Pudding Cr. (Mendocino Co)	Pudding Cr.	Steelhead & Coho	3				✓
Noyo R. (Mendocino Co)	Noyo & 7 tribs.	Steelhead & Coho	8		✓		✓
	Parlin Cr.	Steelhead & Coho	225				✓
Hare Cr. (Mendocino Co)	Hare & 5 tribs.	Steelhead & Coho	6				✓
Jughandle Cr. (Mendocino Co)	Jughandle Cr.	Steelhead	2	✓			✓
Casper Cr. (Mendocino Co)	Casper Cr.	Steelhead & Coho	4		✓	✓	✓
Little R. (Mendocino Co)	Little R.	Steelhead & Coho	3		✓	✓	✓
Brush Cr. (Mendocino Co.)	Brush Cr.	Steelhead & Coho	2	✓			✓
Lagunitas Cr. (Mendocino Co.)	Lagunitas Cr.	Steelhead & Coho	45		✓		✓
	Olema Cr.	Steelhead & Coho	15		✓		✓
	San Geronimo Cr.	Steelhead & Coho	25		✓		✓
	Devils Gulch Cr.	Steelhead & Coho	15		✓		✓

⁵ Cooperative study involving the National Park Service

TABLE III. Department of Fish & Game Periodic Sampling Sites for Coastal Winter-Run Steelhead and Coho Salmon South of San Francisco Bay. Data Collected within the Last 10 years. March 1998.¹

WATERSHED	STREAM	SPECIES	# OF SITES	TYPE OF SURVEY			
				Habitat	Spawning	Out-Migration	Standing Crop ²
San Gregorio (San Mateo Co.)	San Gregorio Cr.	Steelhead & Coho	454	✓			✓
Pescadero (San Mateo Co.)	Pescadero Cr.	Steelhead & Coho	30	✓			✓
	Butano Cr.	Steelhead & Coho	3	✓			✓
	Bradley Cr.	Steelhead & Coho	5	✓			✓
Gazos Cr. (San Mateo Co.)	Gazos Cr.	Steelhead & Coho	12	✓		✓	✓
Ano Nuevo Cr. (Santa Cruz Co)	Ano Nuevo Cr.	Steelhead & Coho	2	✓			✓
Waddell Cr. (Santa Cruz Co)	Waddell Cr.	Steelhead & Coho		✓			
	E. Waddell Cr.	Steelhead & Coho		✓			
	W. Waddell Cr.	Steelhead & Coho		✓			
	Henry Cr.	Steelhead & Coho		✓			
Scott Cr (Santa Cruz Co)	Scott Cr.	Steelhead & Coho	12	✓	✓	✓	✓
	Little Cr.	Steelhead & Coho		✓			
	Mill Cr.	Steelhead & Coho		✓			
San Vincente (Santa Cruz Co)	San Vincente Cr	Steelhead & Coho	10	✓			✓
San Lorenzo (Santa Cruz Co)	Fall Cr.	Steelhead	2	✓			✓
	Zyante Cr.	Steelhead	56	✓			✓
	Branciforte Cr.	Steelhead	10	✓			✓
	Ruins cr.	Steelhead	3	✓			✓
	Mt. Charlie Gulch	Steelhead	7	✓			✓
	Mackenzie Cr.	Steelhead	5	✓			✓
	Lompico Cr.	Steelhead	6	✓			✓
	Bean Cr.	Steelhead	35	✓			✓
Soquel (Santa Cruz Co)	Soquel Cr.	Steelhead	35	✓			✓
Aptos (Santa Cruz Co)	Aptos Cr.	Steelhead	25	✓			✓
Prewitt Cr (Monterey Co.)	Prewitt Cr	Steelhead	2	✓			✓

¹ Additional population data has also been collected by other fishery scientists outside of the California Department of Fish & Game.

² Could mean qualitative standing crop data or just presence or absence of species.

³ This data is from San Gregory Creek and tributaries.

TABLE III. Continued

WATERSHED	STREAM	SPECIES	# OF SITES	TYPE OF SURVEY			
				<i>Habitat</i>	<i>Spawning</i>	<i>Out-Migration</i>	<i>Standing Crop</i>
San Carpofo (San Luis Obispo Co.)	San Carpofo Cr.	Steelhead	1	✓			✓
Arroyo De La Cruz (San Luis Obispo Co.)	Arroyo De La Cruz	Steelhead	4	✓		✓	✓
San Simeon Cr. (San Luis Obispo Co.)	San Simeon Cr.	Steelhead	4	✓		✓	✓
Santa Rosa Cr. (San Luis Obispo Co.)	Santa Rosa Cr.	Steelhead	16	✓		✓	✓
San Luis Obispo Cr. (San Luis Obispo Co.)	San Luis Obispo Cr.	Steelhead	4	✓			✓
San Mateo Cr. (San Diego Co.)	Onofre Cr.	Steelhead	1		✓		
Santa Margarita Cr. (San Diego Co.)	Rainbow Cr.	Steelhead	1		✓		✓

TABLE IV. Department of Fish & Game Multi-Year Sampling Sites (Index Sites) for Coastal Winter-Run Steelhead and Coho Salmon South of San Francisco Bay. Data Collected within the Last 10 years. March 1998.¹

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY ²			
				Habitat	Spawning	Out-Migration	Standing Crop ³
San Gregorio (San Mateo Co.)	San Gregorio Cr.	Steelhead & Coho	21				✓
	Bogess Cr.	Steelhead & Coho	12				✓
Waddell Cr. (Santa Cruz Co.)	Waddell Cr.	Steelhead & Coho	12	✓			✓
Scott Cr. (Santa Cruz Co.)	Scott Cr.	Steelhead & Coho	12	✓	✓		✓
	Big Creek	Steelhead	12	✓			✓
Carmel R. (Monterey Co.)	Carmel R.	Steelhead	24	✓	✓		✓
Big Sur R. (Monterey Co.)	Big Sur R.	Steelhead	12	✓	✓	✓	✓
Arroyo Sequit (L.A. & Ventura Co.)	Arroyo Sequit R.	Steelhead	1	✓			✓
Santa Clara R. (Ventura Co.)	Santa Clara R.	Steelhead	14		✓	✓	
Ventura R. (Ventura Co.)	N.F. Matilija Cr.	Steelhead	44				✓
Santa Maria R. (Santa Barbara Co)	Sisquoc R.	Steelhead	64				✓
Santa Ynez R. (Santa Barbara Co)	Santa Ynez R.	Steelhead	104	✓	✓		✓
	Hilton Cr.	Steelhead	14	✓	✓	✓	✓
	Quiota Cr.	Steelhead	14	✓			✓
	Alisal Cr.	Steelhead	14	✓	✓	✓	✓
	Salsipuedes Cr.	Steelhead	44	✓	✓	✓	✓
	El Jaro Cr.	Steelhead	54	✓	✓	✓	✓
	San Miguelito Cr.	Steelhead	14				✓
Carpinteria Cr. (Santa Barbara Co.)	Carpinteria Cr.	Steelhead	14				✓
Arroyo Hondo Cr. (Santa Barbara Co.)	Arroyo Hondo Cr.	Steelhead	14			✓	✓
Gaviota Cr. (Santa Barbara Co.)	Gaviota Cr.	Steelhead	14				✓

¹ Additional population data has also been collected by other fishery scientists outside of the California Department of Fish & Game.

² DFG also collects some water temperature and invertebrate data but that information is not included in this overview.

³ Qualitative standing crop data.

⁴ Cooperative study involving DFG and other agencies.

TABLE IV. Continued.

WATERSHED	STREAM	SPECIES	# Of SITES	TYPE OF SURVEY			
				<i>Habitat</i>	<i>Spawning</i>	<i>Out-Migration</i>	<i>Standing Crop</i>
	Santa Margarita Cr.	Steelhead	2				✓
Santa Margarita Cr. (San Diego Co.)	Sandia Cr.	Steelhead	1				✓
	Temecula Cr.	Steelhead	1				✓
San Mateo Cr. (San Diego Co.)	San Mateo Cr.	Steelhead	2	✓	✓	✓	✓
San Luis Rey R. (San Diego Co.)	San Luis Rey R.	Steelhead	3	✓			✓
	Pauma Cr.	Steelhead	1	✓			✓

- Assess spawning escapement in the Klamath/Trinity and Smith.
- Monitor out-migration through the mid-reach of the Klamath River Mainstem.
- Obtain spawning escapement for the Klamath River tributaries.

This expanded program is expected to cost an additional \$1.6 million and is being proposed for the FY 1998-99 budget.

A critical aspect of fishery monitoring is the ongoing assessment of adult mortality in the ocean. The source of this mortality can be due to many factors: legal fishing pressure, drift nets, near shore mammals, changes in ocean temperature or up-welling conditions. The current efforts in this area need to be reviewed to ensure they will be able to assess changes in ocean mortality over time as conditions to protect inland habitat conditions progress.

Flow Monitoring

Perhaps one of the largest single factors affecting anadromous fish habitat is river flow. Fish need water, but stream flow provides more than just a medium to live in.

In addition to a host of other functions, flows: (1) define the shape and contour of

the stream; (2) move gravel, sediment and woody material into and through the system; (3) provide and develop fish habitat; and (4) move food items. Fluctuations in stream flow are important to the movement of fish into and out of the tributary areas and in fluvial processes that give a stream special characteristics. Flows from channel shaping events can reset watershed conditions. In stable watersheds, such events can open or reshape new habitats and attract fish to these areas. In unstable watersheds, flood events can move large sediment deposits into the river and adversely affect fish habitat for years into the future. Droughts can adversely affect available habitat with devastating effects on population sizes. Knowledge of the river flow is critical to understanding the processes that are contributing to changes in the abundance of fish and the water quality and pollutant loads in the river.

The Department of Water Resources and the U.S. Geological Survey (USGS) have historically been the two largest providers of river flow information in California. In the past, most effort has focused on areas with water supply potential for human use or flood threats. Over the last few years, limited funds have caused a reassessment of the need to continue to collect data from certain areas. Along the coast of California twenty stream flow measuring stations have been discontinued. However, with the listing

of coho and steelhead a new critical need for flow information has emerged.

The SWRCB has reviewed the existing stream flow stations, the coho and steelhead streams and the areas with proposed new water right appropriations. The following is a preliminary list of areas where stream flow monitoring is needed.

- 1) Maple Creek Tributary to Pacific Ocean
- 2) Little River Tributary to Pacific Ocean
- 3) Jacoby Creek Tributary to Pacific Ocean
- 4) Freshwater Creek Tributary to Pacific Ocean
- 5) Elk River Tributary to Pacific Ocean
- 6) Salmon Creek Tributary to Pacific Ocean
- 7) Bear River Tributary to Pacific Ocean
- 8) North Fork Mattole River Tributary to Mattole River
- 9) Squaw Creek Tributary to Mattole River
- 10) Bear River Tributary to Mattole River
- 11) Wages Creek Tributary to Pacific Ocean

The above list includes 42 new proposed river flow-measuring stations. However, even if only the 20 discontinued stations plus 10 additional stations were implemented in a phased program over a three-year period, \$500,000 would be needed each year. Long-term operation costs would exceed this value. However, it is possible that cooperative funding could be secured with USGS and local groups to keep the long-term costs to the state of these additional sites within the \$500,000 per year range.

Water Quality Monitoring

Water quality monitoring is important, not only because of the importance of water quality to fish and wildlife habitat, but also because of the effects of water quality on drinking water and recreational uses. Water quality monitoring performs the following functions:

- 1) Identification of water bodies where

uses are not being protected from water quality impacts.

- 2) Assessing the relative contribution of different pollutant sources to the water quality problems in individual watersheds.
- 3) Identifying unknown pollutant sources.
- 4) Used as the basis of prioritizing water quality and resource problems.
- 5) Used to develop implementation plans for addressing problems.
- 6) Used as the basis for developing Total Maximum Daily Loads (TMDLs).
- 7) Needed to evaluate compliance of dischargers.

Used to assess effectiveness of corrective actions.

The SWRCB and Regional Boards have developed a Watershed Management Initiative. A part of this initiative is to identify and prioritize all water quality problems over the next five years. Access to critical monitoring data is essential to completing this task. The SWRCB and Regional Boards will be preparing a monitoring proposal over the next several months to identify these monitoring needs. They are committed to working with other interested parties (i.e., stakeholders and agencies) in individual watersheds to identify overall monitoring needs and to pool data collected from all sources. The first step in this process will be developed by May 1, 1998.

Recommended Tasks in Refining the Monitoring Program

The approach to refining a monitoring and research program is patterned after one being developed by the CALFED agencies to coordinate their efforts for the San

Francisco Bay-Delta Estuary Watershed. The CALFED effort is being lead by the IEP, USGS and SFEI and will include all the CALFED agencies and local watershed groups. However, a parallel effort is needed for the other watersheds in the state. It should follow the same timeline so that an overall coordinated picture for the entire state can be set forth. The WPRC effort has a broader geographic scope than does the CALFED effort.

The state can be divided into three broad areas to facilitate restoration and environmental monitoring. They are (1) the coastal watersheds; (2) the Bay-Delta Estuary and Central Valley; and (3) the Eastside watersheds. These areas can be further divided by Calwater watershed as needed (Figure 6-1), but these three areas share issues in common that in many cases are unique and should be specifically recognized in the design and implementation of restoration programs and monitoring activities. The CALFED effort is performing the restoration project coordination and monitoring integration for the Bay-Delta and Central Valley. The WPRC needs to focus its efforts in the other two areas of the state.

A specific work plan with funding should be developed to perform the following tasks. The effort should include involvement of the science panel and the advisory committee's established by the WPRC. The tasks are modeled after those that will be performed by CALFED over the next several months.

The WPRC effort should build off this effort and refine it as appropriate for coastal watersheds.

Task 1 - Define Expectations, Goals, and Objectives

The fundamental charge to the WPRC is to "to provide oversight of state watershed and restoration activities, including the conservation and protection of anadromous

fish." Specifically the council was directed to develop a Watershed Protection Program which shall include an Anadromous Salmonid Conservation Element for the purposes of providing conservation efforts necessary to lead to the promulgation of a 4(d) rule by the National Marine Fisheries Service (NMFS) under the federal Endangered Species Act. One key element of such a program is the monitoring effort that will be used to determine its effectiveness.

A first-cut at the questions the monitoring program needs to answer is set forth in the sections above. These overarching questions form the basis of the vitally important efforts of the WPRC program. In order to assess the efficacy of this complex program they will need a scientifically founded and elegantly designed comprehensive ecological monitoring and research plan. Review of the monitoring questions and work with agency staff and stakeholders to further refine these questions so they can direct the development of a comprehensive monitoring program is needed.

The ultimate goal of any monitoring program is to produce information that is useful in making management decisions enabled by two-way communication between scientists responsible for designing monitoring programs and the users of the monitoring information (National Research Council 1990). Bridging this gap is a crucial

task. The staff from the WPRC steering committee should work with the agencies/stakeholders and the relevant scientific community to further define expectations and goals of the efforts to collect monitoring information that will feed back to the development of the monitoring strategy. These interactions will give decision-makers and managers an understanding of the limitations of the monitoring programs and simultaneously provide the technical experts who are designing the monitoring programs with an understanding of what particular questions need answers.

The process for identifying the specific questions to be addressed by a WPRC comprehensive monitoring strategy would be achieved through the following activities:

- 1) Consulting with agency staff and stakeholders in the watersheds to review the problems or system dysfunction identified in Chapter 5 and to define expectations and goals for information necessary to determine the state of each problem, in priority order.
- 2) Identifying expectations and goals of various ongoing and proposed prioritized restoration efforts
- 3) Identifying relevant laws, regulations and permit requirements that require monitoring.
- 4) Forming a focused review group composed of stakeholders, managers and technical experts for facilitated discussions aimed at synthesizing information in items 1-3 to develop clear goals and objects for the integrated environmental monitoring and research program.

Task 2 - Developing a Conceptual Framework

Conceptual models are needed to incorporate current thinking by scientists about how the ecosystem is structured and how it functions, about the effects of environmental stressors on relevant ecosystem processes, and about the

influences of specific rehabilitation actions. The importance of conceptual models in ecosystem monitoring and assessment has been aptly described in a report issued by the National Research Council, *Managing Troubled Waters - The Role of Marine Environmental Monitoring* (National Academy Press 1990).

A description (i.e., a conceptual model) of the cause-effect links between human activity and anticipated environmental change is the central feature in developing specific questions to be answered. It is the conceptual model that is the means of predicting environmental change and the results of management action-predictions that efficiently direct and focus monitoring efforts. Conceptual models describe links among the resources at risk: the physical, chemical and biological attributes of the ecosystem and human and natural causes of change. The understanding that results permits testable questions to be clearly stated and ultimately evaluated. By providing a context for organizing existing scientific understanding, a conceptual model also identifies important sources of uncertainty.

Although many of the questions arising from a review of existing programs were developed from implicit conceptual models of how the system works, many of these models need to be made explicit. Explicit conceptual models are not only useful in designing a future monitoring program, but are also useful to document the basis for earlier decisions. Providing an objective basis through explicit conceptual models for both the design of a monitoring program and documentation of earlier decisions is a feature essential to development of an integrated environmental monitoring and research program using an iterative approach.

Chapter 3 provides a general conceptual framework for how the watershed processes affect water quality and fish resource values. However, each watershed is different and the critical factors in any specific watershed will be different from other watersheds. The

monitoring programs for these watersheds must be tailor-made to address the issues in that watershed. This is time consuming, but there is no other way to address the diversity of California's coastal watersheds and their inhabitants.

Task 3 - Monitoring Program Design

This section addresses two subjects. The first is development of a long-term coordinated program, which is the major focus of this chapter. The second is the development of an institutional process designed to work in the short-term (one to three years) specifically addressing restoration project monitoring.

Successful design of a long-term integrated environmental monitoring program depends upon the identification of focused questions that can be answered effectively and which are developed from clear management objectives. Preliminary work, including definition of goals and objectives, conceptual model review, knowledge of existing programs and pilot monitoring are often necessary to refine questions and technical aspects of monitoring designs. Some of this work (e.g., defining goals and objectives, conceptual model development) is described in previous sections. The remaining work necessary is described here.

A. Inventory Existing Monitoring Programs

The goal of this task is to identify and assess existing monitoring programs in the coastal watersheds. The DFG Data Co-op has begun this effort. Monitoring needs identified through Tasks 1 and 2 can then be matched with efforts in existing monitoring programs and "gaps in need" identified for augmentation.

An initial summary of fish and water flow monitoring is discussed above. The product will probably be a meta-data information system providing information for each existing program on program objectives,

questions addressed through monitoring, spatial coverage, attributes monitored, location of sampling sites, frequency of monitoring, primary contact, reporting scheme and funding. The system will be designed for continuous use for ongoing coordination, information on program status, and program gap analysis.

This task will need to include a specific funding allocation and include the efforts of local watershed groups doing volunteer monitoring.

B. Develop Monitoring Elements

The goal of this task is to narrow the focus of monitoring from the vast number of questions and parameters that could be examined to those that will produce the specific information needs. This task will be started in conjunction with Tasks 1 and 2, addressing currently known needs of WPRC agencies. Additional information derived from Task 2 and the previous tasks (defining monitoring needs and inventorying monitoring programs) will be used to subsequently modify monitoring elements to ensure their effectiveness.

Based on information described in Tasks 1 and 2, an integrated environmental monitoring and research program that focuses on WPRC's needs will be developed. The strategy will be to identify current needs, identify existing programs, identify monitoring gaps and recommend modifications of programs to fill those monitoring gaps. Quality control and assurance programs (QA/QC) will be reviewed to ensure consistent data collection and storage protocols. Individual data bases will be linked together so the data can be assessed comprehensively. The product will result in a document identifying monitoring objectives, focused questions and specific monitoring elements to address the questions, and will include a recommendation for a detailed plan of comprehensive and integrated monitoring for the estuary.

Process: Technical work teams comprised

of program managers of existing programs will meet with the WPRC steering committee to determine how best to coordinate their programs and add missing components, as needed. Such a strategy has already been proposed for the efforts in the Bay-Delta Estuary and watershed by the CALFED agencies. The WPRC Steering Committee will be responsible for organizing and collating all work into a useable product that will constitute recommendations for an integrated and comprehensive monitoring program.

C. Develop Process for Data Management

Integrated data management will need to incorporate all aspects of the WPRC data collection and dispersal. Data/information will need to be made accessible to agency staff and stakeholders and WPRC staff in time to meet program timelines and provide information for adaptive management plans. Data will also need to be updated regularly to meet the different program reporting timelines and so that information from one program can be related to another.

The goal of the data bases is to develop a comprehensive, integrated data management system that will allow agencies and public access to biological, water quality, hydrodynamic, and physical data from the coastal watersheds. The data can be spatially referenced through a Geographic Information System (GIS). The data include available, accessible data from public agencies, municipalities and larger

private companies and consultants. Data will be stored in an integrated system of distributed relational data base that can be accessed remotely by a wide range of users. Simple queries may be conducted "on the fly" by scientists through menu-driven or graphical user interfaces; more complex queries can be generated by each entity's data base programmers. The intent of the WPRC data base project is not to duplicate or replace the efforts of any one of the entities involved, but to provide a comprehensive, integrated source of data for scientists and decision-makers. This will

yield a "level playing field" for all parties by providing a common, comprehensive set of data for all types of analysis, reports, studies and models concerning the coastal watersheds. This type of data management is currently used by the IEP in the Bay-Delta and can be adapted to address coastal areas.

Process: The strategy of data management will be for those who are collecting data to manage it locally in a data base, and link the individual data bases into a single relational data base that will be made accessible via the Internet. The links will be established via the Internet using open data base connectivity (ODBC). Each participating agency will have an export feature built into their local data base that will provide any updates or corrections to the comprehensive data base. The agencies providing their data will determine when data will be made available to the server. In addition to providing access to data via the World Wide Web, participating parties will also have access to the data via an ODBC link.

D. Develop Process for Data Interpretation and Reporting

Easily understood reports released in a timely manner provide the all-important feedback about monitoring results to managers and regulators. Appropriate interpretation and display must accompany

monitoring data. Annual monitoring reports are envisioned that include both data and interpretive graphs and text.

A committee of managers responsible for monitoring programs, stakeholders and regulatory representatives will meet to design an Interpretation and Reporting Plan that provides for timely and objective interpretation of all monitoring data.

E. Restoration Project Monitoring - Institutional Process

Many of the coastal watershed restoration projects do not include effective

implementation and effectiveness monitoring. A process needs to be in place to determine how effective these programs have been and whether they accomplished goals. To make restoration project monitoring more effective, an effort is needed to develop guidelines and protocols to ensure that:

- 1) Monitoring plans associated with restoration projects are sufficient to identify whether or not project goals and objectives are being met.
- 2) A process is established for the orderly flow of data collection to information from all restoration project monitoring to provide resource managers with information on categories and types of projects that were successful and not successful.

CALFED has funded an effort that addresses their restoration project (often termed Category III) monitoring needs. It includes a position dedicated to chair and coordinate the monitoring of the various restoration projects by CALFED. The chair is assembling a work group to review existing and proposed monitoring elements of Category III projects and develop recommendations for standardized monitoring protocols. The work group will also prepare recommendations for data management and information dissemination. Additional funding will be needed in Phase II to support establishment of the work group for a one-year period to implement this important activity.

The WPRC should develop a similar effort for coastal watershed restoration monitoring efforts.

Task 4 - Design a Focused Research Program in cooperation with CALFED

This task includes design of a focused research program. As already stated, the goals of the focused research program are to reduce areas of scientific uncertainty affecting the achievement of management goals, to identify cause and effect

relationships, and to corroborate relationships in conceptual models. While academic research should be left to the university system focused research is applied to specific management uncertainties and needs to be pursued by resource and regulatory agencies. The CALFED program is developing such an effort. Many of the questions to be addressed by this program are similar to the issues in the coastal watersheds. However, there are specific questions that are unique to the near coast watersheds that should be addressed. The WPRC should be expanded on this effort as appropriate.

The approach would include developing and maintaining a list of study questions, to select objectively a group of focused research projects, and annually to evaluate and present new study findings to the WPRC agencies.

CHAPTER VII

IMPLEMENTATION PLAN

Introduction

Assessing and addressing the problems and opportunities at a watershed level provides the unifying focus for the WPRC Program. Still, structuring a program with state-wide value as large and diverse as California poses a number of challenges. To help meet these challenges, this Implementation Plan first focuses on two over-arching needs of a watershed program: 1) Re-aligning existing resource protection and restoration efforts in a watershed context through development of base-line watershed assessments, and 2) more and better coordination of government policies and programs. The plan then describes changes now underway or proposed as means to:

- Improve existing State resource protection and restoration programs
- Assist both local governments in addressing their responsibilities and voluntary, community-based watershed efforts
- Refine and augment existing monitoring efforts to inform and guide watershed level efforts.

Summary of Actions

The actions either now being implemented as a result of the WPRC effort or being proposed by the WPRC for implementation are summarized in this section. Background information and greater detail for these actions are provided in subsequent sections of this chapter.

Watershed Assessments

The starting point for a watershed approach to resource protection and restoration is understanding the current status of the distinct watersheds. Conditions vary naturally across different watersheds. Human activities and their impacts have similarly varied across different watersheds. Therefore, in order to understand the effectiveness of protection and restoration policies, each agency must review and adjust its programs to address the conditions of distinct watersheds. The application and level of protection policies must take place and be adjusted, as required by CEQA, in the context of past cumulative impacts and those reasonably foreseeable. This assessment can also support landowners in tailoring their activities in light of the factors limiting the health and productivity of their specific watershed. A proposed approach to a cost-effective and timely development of these base-line watershed assessments is described in this report.

Coordination of Government Policies and Programs

A common refrain from both local governments and community-based groups is a desire to move beyond “talking the talk” about better coordination. The “alphabet soup” of State and federal agencies creates confusion through the variety of requirements and processes. At their worst, these processes seem to contradict one another. A widely expressed request is to streamline the State and federal processes for providing technical and

financial assistance, as well as the regulatory review processes for watershed protection and restoration efforts.

Consequently, this report proposes key coordinating mechanisms. These are intended to increase the capacity of the State, federal and local government to better meet their responsibilities, as well as to better foster and support community-based watershed efforts.

Coordination Between Relevant State Agencies

The State needs an internal coordinating mechanism. Agencies and the Departments within the WPRC will each designate a high-ranking individual to be responsible for their agency's coordination and implementation of this Program. These individuals will jointly determine needed State agency coordinated actions and be responsible for securing their agency's needed contributions and efforts.

This group would address the role of state-wide programs and policies, and how to better align or coordinate them to support watershed protection and restoration. This should be accomplished by either the expansion of the WPRC to include local and federal representation or; the California Biodiversity Council assuming responsibility for appointing this State-level coordination group.

Technical Assistance

Government should establish a single coordinated program of support and assistance. It is critical to align the various technical assistance at the field level to simplify its access and increase its utilization.

The WPRC will direct establishment of basin level technical coordination teams to determine the most effective and efficient mechanisms for delivering technical assistance within the geographic

boundaries of their basin, as well as to watershed specific efforts within that basin. These teams will include representatives of State, federal and local governments, non-government technical support organizations, landowners and watershed groups.

Regulatory Coordination

Permit streamlining for watershed enhancement/restoration projects: The regulatory agencies will establish a task force, including representatives of local governments, landowners and conservation interests, to determine:

- a) qualifying criteria for a stream-lined review and approval process for watershed enhancement/restoration projects; and,
- b) the overall best mechanisms to integrate/coordinate regulatory review and approval of watershed enhancement/restoration projects.

Providing regulatory assurance: The basic trade-off for landowners and resource producers to invest more time and money on the front end in some form of watershed stewardship plan is that it becomes a basis for securing their legal compliance with a variety of State, federal and local laws.

The regulatory agencies will establish a task force, including representatives of local governments, landowners and conservation interests, to determine:

- a) the integrated goals of State and federal law in regard to species and clean water protection at a watershed level;
- b) a process for regulatory review and approval of watershed stewardship plans as a single basis for compliance with species and water quality laws.

Information Management and Sharing

The WPRC agencies will coordinate both existing and new watershed information and make it available to all interested parties. This will be accomplished through the following actions:

- a) pool funding and staff resources for joint data development in high priority information areas where data is incomplete;
- b) develop a regional database structure for use by all agencies and the public that results in consistent information across jurisdictional boundaries;
- c) utilize common standards for describing data elements (e.g., watershed delineations, species names) and documenting them as metadata (data about the data);
- d) coordinate research efforts to address high priorities and avoid duplication;
- e) establish efficient data sharing mechanisms that provide a single point of access from distributed and locally maintained data sources;
- f) integrate the watershed program information associated with the Watershed Information Technical System (WITS) and the watershed data associated with the California Rivers Assessment (CARA) in a unified watershed system;
- g) explore agency-university partnership agreement; and, utilize field personnel and other local expertise for capturing, maintaining, and assessing the accuracy of watershed data sets.

Coordinated Funding Cycles and Review Processes

A Task Force of funding program managers will be established by March 1999. By June 1999, the Task Force will recommend a process for combining relevant programmatic requests for proposals and coordinated review of grant applications, and by September 1999, implement recommended funding process.

Education and Outreach

By October 1999, the WPRC agencies will support ten watershed groups throughout the coastal region by providing local staff support to coordinate the building of partnerships and identification of possible funding sources for that watershed's proposed projects.

Direct state and federal funding will be provided to support the hiring and training of watershed coordinators throughout the State. Coordinators should be locally hired and funded with a 50% local match.

Workshops and Training Programs

All relevant state watershed training programs will be inventoried by March 1999 and coordinate with federal efforts to produce a federal inventory of watershed training programs as directed by the Clean Water Action Plan.

By October 1999, an interagency watershed education program will be developed for agency staff, watershed coordinators, landowners, and the public school system that would include interagency watershed training and skills classes; workshops on regulatory processes; and development of appropriate outreach materials (e.g., how-to handouts).

A local stewardship award for fish-friendly watershed practices will be established by December 1999.

Project Tracking

A Natural Resource Project Inventory (NRPI) will be established by March 1999 as the clearinghouse for all current and future state-funded watershed projects.

By June 1999, all funded watershed protection and restoration projects will be required to use the NRPI forms to document information about their project as a condition of the grant.

By July 1999, funding from the various watershed protection and restoration programs will be secured to provide for the continued input of new project information and the maintenance of the NRPI system.

Monitoring Program

Monitoring the status of stream, fishery and watershed resource values is a critical component of a successful watershed protection and restoration program. Without a well-coordinated monitoring effort, the success of this program cannot be assessed nor can adaptive management principles be applied to the protection and restoration efforts of watershed groups and agencies. The following tasks should be accomplished to develop and implement an effective monitoring program for the WPRC.

By March 1999 - Establish a steering committee to develop the management structure for the WPRC monitoring effort.

By August 1999 - Execute a Memorandum of Understanding (MOU) among state agencies to coordinate their surface water, fisheries and watershed resource monitoring programs and provide cost estimates and sources of funding for the development of the monitoring program.

By September 1999 - Continue existing statewide surface water, fisheries, and watershed resources related monitoring, but implement them under the new coordination structure called for in the MOU.

By December 1999 - Define the expectations, goals and objectives of the monitoring program.

By February 2000 - Review the conceptual framework to be used to guide the development of the monitoring program.

By August 2000 - Complete monitoring program design including: an inventory of existing monitoring programs, new monitoring program elements, data management principles, a process for data interpretation

and reporting, restoration project monitoring and a focused research effort in cooperation with CALFED.

By September 2000 - Develop Budget Change Proposals (BCP's) necessary to implement the monitoring program.

By September 2000 - Broaden the state agency monitoring MOU to include interested federal and local agencies and groups.

June 2001 - Implement the WPRC monitoring program and annually thereafter review its findings and make necessary changes.

State-Level Efforts

A Steelhead MOU with NMFS

As a result of a March 1998 MOU with NMFS, the State is implementing a series of conservation commitments to provide greater protection for steelhead in two Northern California regions proposed for listing under the ESA. Initial changes and commitments have already been made in State fishery harvest regulations, hatchery practices and funding of an expanded monitoring effort. Additionally, the State and NMFS jointly committed to undertake a review of the adequacy of California's conservation programs. The joint review effort is now underway with an initial focus on California's Forest Practice Rules and their implementation. A set of questions jointly developed by the State and NMFS has now been forwarded to the forest practices subgroup of the overall Science Panel.

Program Funding

In the last two State budgets, annual State investments in coastal watershed efforts have been increased over \$11 million.

The Governor also proposed a longer term funding source as part of his 1998 budget. Final agreement could not be reached with

the Legislature in time for placement on the November 1998 ballot.

Water Rights

The SWRCB has been developing new criteria requirements to protect fish habitat from small and moderate water project development in streams, which may support anadromous fish.

SWRCB staff is proposing that the following requirements be considered in all coastal watersheds where steelhead trout or coho salmon habitat needs to be protected. These requirements will be applied on a case-by-case evaluation of the specific circumstances and the need to protect fish habitat:

- Bypass flow
- Season of diversion
- Prevention of migration barriers/offstream storage
- Fish screens
- Limited rate of diversion.

Water Quality

Relevant strategic plan improvements of the SWRCB and Regional Boards are directed at increasing the capacity of programs through efficiencies and coordination, ensuring that protective standards are in place, increasing compliance with water quality laws and reducing transaction costs and time associated with obtaining permits and approvals.

The Boards' Watershed Management Initiative, launched in 1995, has been augmented by a 1998 Implementation Plan and ten new staff positions. The Plan and staff will increase the coordination of other governmental agencies and programs and assist local watershed groups.

The SWRCB will continue to work with the California Coastal Commission, U.S. EPA and the National Oceanic and Atmospheric Administration to develop and implement a 5

and 15 year implementation plan and strategy to bring California into conformity with the federal Coastal Zone Act Reauthorization (CZARA).

Work related to setting statewide standards for protecting waters in focusing on Inland Surface Waters, Enclosed Bays and Estuaries, the Ocean and Thermal issues. The North Coast Regional Board will be reviewing its standards and regulatory framework in the Russian River watershed for compliance with a "no take" provision under the federal ESA.

The SWRCB and the Regional Boards are continuing to develop and implement enforcement measures to assure compliance through increased efficiencies and field presence. These efforts have been augmented by policy guidance, an enforcement strategy and 23 new staff positions (starting in FY 1997).

Permit streamlining efforts by the SWRCB and Regional Boards are focusing on the three phases of the permitting process, pre-application, application submittal and application processing.

Stormwater Discharges

Caltrans has applied for a statewide NPDES storm water permit to cover discharges of storm water from highways and highway related facilities. The permit will address design, maintenance and construction activities within Caltrans jurisdiction.

To implement these programs, BMPs have been developed and are contained in four storm water quality handbooks: Planning and Design Staff Guide, Construction Staff Guide, Construction Contractors Guide, and Specifications. Training has been conducted throughout the state.

Confined Animal Facilities

A partnership has been formed between federal and State regulators, the University

of California, and California dairy industry. The program's objective is to assist California dairy producers in meeting all federal, State, regional and local requirements relating to manure and nutrient management.

Beginning in November 1998, the California Department of Food and Agriculture will be facilitating a six month pilot project, with all partners and other interested parties, to develop policies and procedures for the program. At the end of the pilot project, a set of recommendations will be forwarded to the partners for their concurrence. Implementation of the full program is expected in Fall of 1999.

Pesticides

The California Pesticide Management Plan for Water Quality is a joint effort by Department of Pesticide Regulations (DPR) and the SWRCB to protect water quality from the potential adverse effects of pesticides.

DPR, in cooperation with the SWRCB, is currently developing specific actions for implementing critical elements of the Plan. These include:

- Collection and evaluation of surface water monitoring results
- Evaluation of valid data: DPR will identify potential sources of the pesticide, compare levels of detection to established water quality standards or other appropriate values, and determine the need for and degree of mitigation measures.

The next steps in implementation of the Plan for DPR include developing criteria for:

- Determining if monitoring data are valid based on completeness and quality
- Determining if water quality standards or goals are not being met
- Determining if the presence of pesticides is the result of legal use

- Working with affected stakeholders to develop mitigation measures.

Forestry Activities

The Director of Forestry and Fire Protection appointed an internal Task Force in September. Working mostly by conference call, it meets weekly. Its goals are to facilitate watershed level approaches to timber harvesting issues and to improve communication between Review Team agencies and others.

To date, the Task Force has worked with Division of Mining & Geology (DMG), Dept. of Fish & Game (DFG), State Water Resources Control Board, and the North Coast Regional Water Quality Control Board to identify areas of improved cooperation.

For DMG, the Task Force is exploring ways to improve the assessment of mass wasting and unstable areas, including the development of a training program for Registered Professional Foresters (RPFs) that will be consistent with State Laws governing the practice of geology.

CDF has requested consultation from DFG that will lead to watershed level biological opinions that will assess the status of salmonids, identify limiting factors, and indicate the kinds of management measures that could address DFG concerns. The Task Force is also working to develop common training programs for CDF and DFG biologists that review timber harvest plans and ultimately for RPFs that develop THPs.

For the State Water Resources Control Board and the North Coast Board, the Task Force is working on joint GIS data base development. CDF has appointed an internal working group to be involved more strongly in TMDL development on the North Coast. CDF also will revisit concerns expressed by the boards over the existing Forest Practice Rules.

As provided for in the MOU with NMFS, the Scientific Review Panel has been selected

and has begun the task of evaluating the effectiveness of California's Forest Practice Rules.

Range Management

The State proposes to utilize and strengthen the Rangeland Water Quality Management Plan approach. The goal is to provide range landowners an efficient means to satisfy the water quality standards of the State, the federal Clean Water Act, and State and federal endangered Species Acts.

The State will initiate a review by State and federal entities, in conjunction with landowner representatives, of protocols used in the Rangeland Water Quality Plan process. The goal is to reach agreement on protocols that can be certified by the reviewing agencies as either beneficial or benign for species of concern and water quality. Range owners or operators who voluntarily develop and implement a Rangeland Water Quality Plan based upon the certified protocols will receive letters of assurance from the reviewing agencies.

Upon commitment by the relevant federal agencies to participate in this review, the State will seek the additional funds required to implement the proposed Coastal Watershed Pilot Project to bolster UC Extension's capacity to conduct Rangeland Water Quality Plan workshops throughout this region.

Agricultural Management

As an augmentation to existing agricultural efforts, the State will participate in a review by State and federal entities with ESA and CWA responsibilities, in conjunction with landowner representatives, of the NRCS's Field Office Technical Guide protocols. The State goal is to reach agreement on protocols that can be certified by the reviewing agencies as either beneficial or benign for species of concern and water

quality. Agricultural owners or operators who implement certified protocols will receive letters of assurance from the reviewing agencies.

Fish and Game Activities

In its recent reorganization, the California Department of Fish and Game (CDFG) has elevated watershed protection and restoration to a Branch status. With a Chief and small staff and Headquarters to set policy, coordinate with other agencies, and support field staffs assigned to CDFG regions, the Branch will ensure that watershed activities such as assessments, data coordination, planning, technical assistance, education and training, as well as actual habitat restoration projects, occur and are funded adequately.

Supporting Local Government and Community Efforts

Over the past two years, the State has increased annual funding for watershed protection and restoration efforts by approximately \$11 million. The State of California has also participated as a member of *For Sake of the Salmon* in development of the proposed Pacific Salmon Fund. This proposal seeks creation of a federal matching fund for non-federal investments in watershed protection and restoration efforts.

The State of California is now working with the States of Oregon, Washington and Alaska to craft a coast-wide federal salmon/watershed fund. The intent is to propose inclusion of a six year, \$200 million per year fund in the President's FY 2000 budget proposal. This approach would leverage non-federal funds by providing a federal match for qualifying watershed investments that benefit salmon and other indicators of watershed health.

The State Program also will establish mechanisms to ensure that technical and financial resources, as well as regulatory and monitoring efforts are better coordinated. This is intended to support local governments and community based groups in fulfilling their local objectives within the context of the various State and federal resource protection mandates. For a description of these improvements, please see the descriptions above of actions to increase and improve coordination of policies, technical assistance, monitoring, regulatory responsibilities, education and grant programs.

Role of Federal Agencies

As the number of listings in California under the federal ESA and the CWA have increased, the role of federal agencies has dramatically increased. They now both have greater authority to bring to bear and greater responsibility to exercise this authority beneficially.

The State recognizes that achieving the goals of the WPRC require a substantive, respectful working partnership with the federal agencies. As described in this report, the State and federal agencies are currently working together on a variety of programs.

The federal government has itself been increasingly touting watershed level approaches as an approach of great potential and priority. Most recently, the federal Clean Water Action Plan has described the increased federal commitment to this approach and a wide-ranging set of proposed actions to support its further development and implementation (Appendix I). The WPRC is pleased by the recognition in the draft Clean Water Action Plan of both watershed management and state-led efforts. In a section titled "Watershed Management: The Key to the Future," the report notes:

"Federal Agencies can provide technical and financial help to

facilitate watershed management, but State and tribal leadership is essential to bring all levels of government, the private sector, and the public together to make watershed management work."

Consistent with this federal recognition of State leadership, we suggest the following important roles for our federal partners:

- 1. Better and more coordination among federal agencies, as well as between them, the State, tribal and local governments and the varied community interests**

The wide-spread criticism of the inadequate coordination between the State and federal agencies reflects that we must both substantially increase our efforts devoted to coordination of programs, policies and resources. The coordination mechanisms proposed in this report can only achieve their intended benefits if the federal agencies participate fully in their development and implementation.

- 2. Clearer, more functional description of goals of CWA and ESA**

A current major vulnerability for this program is the lack of specificity and clarity on what the State program, or watershed level efforts, need to achieve in order to be adequate as a basis for compliance with the ESA and CWA. Absent this, the State, local government and cooperating landowners could make major investments of time and resources and yet remain vulnerable to arbitrary federal decisions. The State proposes a means to jointly define the integrated goals of State and federal law. Again, this key element can only be developed with the full participation of the federal agencies.

- 3. A mechanism to utilize a watershed plan approach as means for documenting compliance with federal laws and securing regulatory assurance**

The basic trade-off for landowners and resource producers to invest more time and money on the front end in some form of a watershed stewardship plan is that it becomes a basis for securing their legal compliance with a variety of State, federal and local laws. There remains an absence of any agreed upon criteria or mechanism to utilize a watershed-oriented approach as a means of compliance with the ESA and CWA. Consequently, there is not as yet sufficient reward for landowners to invest the time and money up front in pursuing a watershed-oriented approach. The State proposes to jointly determine mechanisms to certify watershed approaches as meeting the requirements of State and federal law. This effort will also require the full, constructive participation of the federal agencies.

4. Funding

The other refrain from all parties is the need for greater investments in needed restoration and protection efforts. As is equally evident, the work will take many years and hundreds of millions of dollars to accomplish. The federal government needs to be a full partner, similar to its willingness to partner for the Everglades in Florida. Governor Wilson has joined with Governor Kitzhaber of Oregon, Governor Locke of Washington, and Governor Knowles of Alaska in requesting the Clinton Administration to make a significant commitment in their next federal budget proposal to watershed level approaches to restoration of anadromous salmonids and water quality.

A positive response to this request is essential if the needed work is to occur.

Basic WPRC Principles

Comprehensiveness

All of the significant factors affecting the resource must be addressed in a comprehensive watershed approach. A comprehensive watershed approach

considers the whole drainage basin and seeks ways to enhance the overall health of the aquatic system and protect the natural resources that extend from ridgetop to ridgetop and from the headwaters to a basin outlet.

Commitment and Leadership

A successful watershed approach at the local scale will have as its foundation the commitment and leadership from those who live and work in the watershed. Commitment and leadership at the statewide level also is necessary to ensure statewide program coordination and governmental assistance in an efficient manner.

Process and Communication

“Process” is as important as “outcome” in the development of a watershed program. Participants in the development of a watershed strategy need to be representative of the various stakeholder groups in a watershed and be involved throughout the process. The mutual exchange of ideas, information, and perspectives provide for an on-going process and opportunities for input.

Integration of Science and Local Knowledge

A watershed approach should integrate the best available scientific information with existing local knowledge about resource conditions, responses and issues. A common sense approach should guide the application of scientifically derived solutions.

Adaptive Management

A watershed approach involves learning. Watershed monitoring will help to evaluate the changes in management that may be needed to better meet watershed goals and objectives.

Cooperation and Coordination

A watershed approach fosters local interest and participation in all aspects of a

watershed program and provides a foundation for partnerships among government, public, private sector, and tribes. The involvement of all stakeholders in watershed program implementation is critical to successful watershed management.

Locally-based

A watershed approach should be locally-based. The greatest knowledge and commitment to healthy watersheds reside with those who live there. Inclusion of all affected parties at the start of a watershed planning process through the final implementation phase is essential.

A locally-based effort should include representatives of landowners, fishery and conservation interests, economic interests, as well as State, federal and local governments, and non-government technical support organizations and watershed groups.

WPRC Policies

The WPRC is committed to the following policies to better meet their responsibilities and promote community-based watershed efforts:

The WPRC agencies commit to promoting maximum coordination, communication, and cooperation at all levels, including amongst themselves and with the involved community-based watershed groups. Statewide, many watershed management efforts are already being planned or implemented. Among such important existing efforts are Coordinated Resource Management Plans, Sustained Yield Plans, Habitat Conservation Plans, Rangeland Water Quality Management Plans, and coordinated county programs. These efforts may involve individual landowners, non-government organizations, as well as local, State, and federal governmental entities. The intent of the WPRC Program is not to displace this work; rather, it is to add value to existing efforts where requested

and to help foster new community-based planning efforts.

Participation in community-based watershed efforts will be voluntary. Those who do not participate will need to meet their legal responsibilities through the existing regulatory process.

State financial and technical assistance in support of the WPRC program will emphasize assistance to community-based watershed groups that have enlisted a diverse representation of community interests. Given that every watershed is different, the community group will identify the key local stakeholders (landowners, business and industry groups, conservation organizations, residents) in their watershed and will work with those who have an interest in developing viable watershed solutions.

The major environmental goals of the WPRC Program are to ensure that human activities are conducted in a manner that protects environmental values, and to provide incentives and assistance to efforts to restore and enhance currently degraded environmental values.

The major economic goals of the WPRC Program are to enable the plan submitters to meet requirements of local, State and federal law more efficiently and to provide them meaningful regulatory stability. The agencies participating in this program have existing statutory mandates that define their activities. Nothing in this program will establish new mandates or take away from existing authorities.

Development of Base-Line Watershed Assessments

The listed ESUs of coastal counties contain 30 watershed units, each with a unique combination of environmental conditions and

management histories that have been contributed to the decline of steelhead and coho salmon. Until a DFG and NMFS sanctioned study indicates that achievable levels of steelhead and coho populations and their habitats are attained and being maintained in a given watershed, the WPRC agencies and Departments will use the following policies to guide their decisions:

- Continual improvement in steelhead and coho populations and habitat is necessary
- For factors in specific watersheds that are effecting fish habitat during critical times of the year, cumulative impacts on fish populations and habitat will be assumed to exist
- Any potential future impact on these factors during critical times of the year will be considered significant until found otherwise.

It is desirable to attain the achievable fish populations and lift these regulatory policy constraints in the most effective and efficient manner. To this end, it is vital that the money, resources and efforts invested in watershed management and monitoring be focused on and adequately address those factors that are most important and not be wasted on factors that are not significant. Achieving effective and efficient watershed management and monitoring requires an adequate understanding of the dominant ecological processes and functions, as well as the real limiting factors on steelhead and coho populations and habitats in each watershed. Thus, it is necessary to have a sound assessment of existing baseline conditions within each watershed that directly or indirectly affects steelhead and coho populations and their habitat. These watershed assessments will be based largely on existing available information and knowledge held by the agencies and other stakeholders, and will be performed collaboratively in a locally-lead community-based watershed group.

To support the watershed assessment efforts of the community-based groups, the State agencies will do the following:

1. Compile and make available existing information regarding watershed conditions and history

Each agency and department listed as part of the WPRC will review existing information regarding watershed conditions, natural and management history, and ecological processes and functions that may be germane to the history, existing condition, protection, and/or recovery of steelhead and coho populations and their habitats. Existing information doesn't necessarily mean written. The experience and knowledge of those agency personnel familiar with the watershed should be used. The State will also draw from the expertise and knowledge of other agencies and public knowledge. NMFS and other relevant federal agencies will be invited to participate. State agencies will make a public call for other information. Each department will inform the community-based watershed group and DFG of the information that it identified and will compile whatever information the group and DFG requests and make it readily available to the group, DFG and other interested parties.

2. Provide guidance documents to assist community-based groups.

The WPRC will commission a set of guidance documents to assist the agencies and community-based groups in:

- Identifying the watersheds and subwatersheds where the greatest return can be expected from investments of money, resources, and efforts to protect and/or restore steelhead and coho populations and their habitat
- Conducting watershed assessments within a logical framework to ensure that nothing important is overlooked and that efforts stay focused on what is important
- Establishing adequate and feasible watershed goals to support fish population/habitat protection and recovery.

Use of these guidance documents will not be mandatory, but will help ensure consistency in assessment and in decision-making.

3. Participate in watershed assessment with local stakeholders

Each WPRC agency and department that holds information requested by a community-based watershed group, provides funding for watershed assessment or management, or conducts or controls activities that could affect steelhead or coho populations or their habitats, will assign a representative to participate with the community-based watershed group in conducting the watershed assessment. At the request of the group, Department of Fish and Game (DFG) representatives may serve as technical advisors. The DFG representatives will encourage inclusion of NMFS and other relevant federal agencies in the group. The watershed assessment will generally include, but is not limited to:

- Identification and evaluation of the condition of fisheries populations/habitat, the life history needs of the affected fisheries, and related beneficial uses of water
- Identification and evaluation of the instream/nearstream factors, conditions, or inputs (e.g., flow, heat, nutrients, sediment, large organic debris) that limit or threaten the fisheries, and/or beneficial uses
- Identification and evaluation of the inherent watershed processes, functions, and sources (e.g., landslides, unstable channels, soil erosion) that affect the instream environment
- Historic and existing human management factors that affect the instream environment and watershed processes and functions
- The relative cost and benefit of various approaches to improving watershed and instream conditions to better protect/restore fisheries populations and habitats.

4. Determine the status of fisheries and water quality within the watershed

In collaboration with the community-based group, the DFG will lead the biological assessment. DFG shall also make the determination (signed by a Director's designee) as to the status of the fishery and causes for decline. A Regional Water Quality Control Board may refine its determination of the degree of threat to or impairment of the beneficial uses of water in the watershed and may do so in collaboration with the community-based group.

5. Participate with local stakeholders in setting watershed management goals

Each agency and department will collaborate with the community-based watershed group to establish a set of goals to support a fish population/habitat recovery rate that is reasonably attainable and allows compatible land management practices. Where these goals conflict, the departments will work together with the community-based watershed groups to resolve these differences and develop a set of unified goals.

6. Determine potential impacts and develop positive measures to reach goals

Based upon the watershed goals established by the process set forth above, each agency and department will determine where their permit or project authority potentially interfaces with the identified fish elements, water quality, and watershed functions in a manner that would not support the protection/recovery goals. They will then develop positive measures of protection to reach the goals and will determine what specific quantifiable measures in its programs that support the goals, what changes or additions to the existing protective measures will be implemented, what changes are needed but cannot be immediately implemented due to limitations in authority, funding, or resources,

and what will be done to try to overcome those limitations. Each agency and department will submit a draft report incorporating its findings and recommendations to the community-based group for its review and comment and prepare a final report that addresses the group's comments.

Program Coordination

Providing State support and assistance to local governments and community-based watershed efforts represents another dimension of the challenge. A common refrain from both local governments and community-based groups is the lack of adequate coordination and cohesion between and among the State and federal agencies. This "alphabet soup" of State and federal agencies creates confusion through the variety of requirements and processes. At their worst, these processes contradict one another. A widely expressed request is to streamline the State and federal processes for providing technical and financial assistance, as well as the regulatory review processes for watershed restoration or enhancement projects and programs.

There are several levels to the needed coordination, as well as distinct geographic and functional areas requiring improved coordination. These are discussed below.

State-level Program and Policy Coordination and Oversight

Overall policy level coordination and program oversight should be provided by expansion of the WPRC to include local and federal government representatives. This group would address the role of state-wide programs and policies, and how to better align or coordinate them to support watershed protection and restoration.

Under the current Executive Order, the WPRC is scheduled to sunset on January 1, 1999. Therefore, we recommend that either: 1) the WPRC be extended for another year to allow the incoming State Administration a mechanism to implement this recommendation or; 2) the California Biodiversity Council assume responsibility for appointing this state-level program and policy coordination group.

In order to engage effectively with local and federal levels of government, as well as landowners and the varied community interests, the State needs an internal coordinating mechanism. Agencies and departments within the WPRC will each designate a high-ranking individual to be responsible for their agency's coordination and implementation of this Program. These individuals will jointly determine needed State agency coordinated actions and be responsible for securing their agency's needed contributions and efforts. These individuals will also inform their Directors about all significant matters pertaining to implementation of this Program and related interagency coordination issues.

Technical Assistance

Landowners or community groups, whether a County or RCD, should not have to deal separately or sequentially in securing government participation and assistance in development and implementation of watershed management and restoration plans. Instead, government should establish a single coordinated program of support and assistance.

Technical assistance is usually provided to local governments, individual landowners, association of landowners or community-based watershed groups. Consequently, it is critical to align the various technical assistance at the field level to simplify its access and increase its utilization.

Action: The WPRC will direct establishment of basin level technical coordination teams to determine the most effective and efficient

mechanisms for delivering technical assistance within the geographic boundaries of their basin, as well as to watershed specific efforts within that basin. The new coordination structure for delivery of technical assistance should become fully operational in fiscal year (FY) 99/2000.

These coordination teams should also review the adequacy of current technical assistance to meet the needs of local governments and community-based watershed groups, and present their findings to the WPRC by July 1999 (see Appendix J for a summary of a 1996 assessment of landowner technical needs).

These teams should include representatives of State, federal and local governments, non-government technical support organizations, landowners and watershed groups.

Regulatory Issues

In asking landowners and local community interests to coordinate and cooperate among themselves for public and mutual benefit, the government needs to task itself the same responsibility to coordinate and cooperate for public and mutual benefit. In the regulatory realm, there are two pre-eminent areas in need of greatly improved coordination.

Permit Streamlining for Watershed Enhancement and Restoration Projects

Currently, one of the major disincentives for landowners and community interests to invest the time and effort in restoration projects is the current regulatory review and approval process.

The goal of this task is to achieve a one-stop shop for approval, or at least a highly coordinated review and approval process for watershed restoration or enhancement projects or programs. The State should

make a high level commitment to this effort, and seek similar high level commitment for participation from federal agencies, including: NMFS, F&WS, COE, EPA and NRCS.

Action: The regulatory agencies will establish a task force, including representatives of local governments, landowners and conservation interests, to determine:

- a) qualifying criteria for a stream-lined review and approval process for watershed enhancement/restoration projects;
- b) options for integrating, or at least highly coordinating, the current separate review processes;
- c) the overall best mechanisms to integrate or coordinate regulatory review and approval of watershed enhancement/restoration projects.

The revised review and approval process should be operational within FY 1999/2000.

Providing Regulatory Assurance

The basic trade-off for landowners and resource producers to invest more time and money on the front end in some form of an integrated resource stewardship plan is that it becomes a basis for securing their legal compliance with a variety of State, federal and local laws. Biological science has increasingly documented John Muir's intuitive insight that "When you pull anything out, you find it connected to everything else." Yet, we now have a fragmented set of institutions and processes. This complicates the already significant challenge of supporting integrated resource management at the watershed level.

There remains an absence of any agreed upon criteria or mechanism to utilize a watershed protection approach as a means of compliance with the ESA and CWA. Consequently, there is not as yet sufficient reward for landowners to invest the time

and money up front in pursuing a watershed protection approach.

Action: The regulatory agencies will establish a task force, including representatives of local governments, landowners and conservation interests, to determine:

- a) the integrated goals of State and federal law in regard to species and clean water protection at a watershed level. (See Appendix K for the results of a 1996 State/federal interagency work group, which can serve as a starting point.)
- b) the overall best mechanism to enable a watershed stewardship plan to serve as a basis for achieving compliance with species and water quality protection laws;
- c) a process for regulatory review and approval of watershed stewardship plans as a single basis for compliance with species and water quality laws.

Information Management and Sharing

Information is vital to the many watershed management efforts ongoing through California. Efficient and effective methods for developing, integrating and distributing scientific information are crucial to the success of a coordinated watershed program. Considerable challenges remain in providing integrated information from multiple sources in a way that is reliable and easily interpreted at the watershed scale. Fundamentally what is required is a change in the ways individual organizations collectively interact in the development and management of watershed data. In an era of shrinking funding, we can no longer afford to pursue watershed data programs in isolation. We must foster collaborative approaches to enhance our individual and collective capabilities for developing and using information. The current decision support procedures of most organizations are inefficient and ineffective in accessing the full array of existing and relevant data.

Each organization has developed its own data development and management strategies. Each is different in ways that substantially deter integration and distribution.

The California Environmental Resources Evaluation System (CERES) is envisioned as the mechanism for providing the initial point of entry to watershed information for the State. However, it is not necessary or recommended that CERES serve as the steward of watershed information. Instead, an agency-university partnership agreement should be developed that facilitates the co-location and funding of agency and university technical staff for the purpose of joint data collection, analysis, and project support. Ideally, regional centers would occur in each of the ten basins of the state for the purpose of regional information management and training. These ten basins are a manageable size for focusing upon detailed data and incorporating local knowledge.

Before embarking upon ten regional centers, a pilot regional watershed center should test the feasibility of this approach. The John Muir Institute of the Environment at U.C. Davis should be considered as an initial place to facilitate collaboration with agency watershed programs managed from Sacramento. This newly established institute facilitates research and exchange of information to improve the scientific basis for decisions on environmental issues. The Information Center for the Environment (ICE) and the Center for Integrated Watershed Science and Management are programs of the John Muir Institute of the Environment.

To ensure that the data will be used to its fullest potential, a joint agency-university training program should also be developed to teach users how to access data, analytical tools, and make use of the Internet.

Action: The WPRC agencies will coordinate both existing and new watershed information and make it available to all interested parties. This will be accomplished through the following actions:

- a) pool funding and staff resources for joint data development in high priority information areas where data is incomplete;
- b) develop a regional database structure for use by all agencies and the public that results in consistent information across jurisdictional boundaries;
- c) utilize common standards for describing data elements (e.g., watershed delineations, species names) and documenting them as metadata (data about the data);
- d) coordinate research efforts to address high priorities and avoid duplication;
- e) establish efficient data sharing mechanisms that provide a single point of access from distributed and locally maintained data sources;
- f) integrate the watershed program information associated with the Watershed Information Technical System (WITS) and the watershed data associated with the California Rivers Assessment (CARA) in a unified watershed system;
- g) explore agency-university partnership agreement; and,
- h) utilize field personnel and other local expertise for capturing, maintaining, and assessing the accuracy of watershed data sets.

Education and Outreach

Watershed Coordinators

Watershed coordinators play a key role in effective watershed groups. They keep watershed planning and implementation on track -- they develop strong partnerships between private landowners and the community-based watershed association, and they identify possible funding sources for various watershed projects. Clearly, the most effective watershed groups are those with locally-hired watershed coordinators.

Action: By October 1999, support ten watershed groups throughout the north

coast region by providing local staff support to coordinate the building of partnerships and identification of possible funding sources for that watershed's proposed projects.

Provide direct state and federal funding to support the hiring and training of watershed coordinators throughout the State. Coordinators should be locally hired and funded with a 50% local match.

Workshops and Training Programs

Action: By March 1999, inventory all relevant state watershed training programs and coordinate with federal efforts to produce a federal inventory of watershed training programs as directed by the Clean Water Action Plan.

By October 1999, develop an interagency watershed education program for agency staff, watershed coordinators, landowners, and the public school system that would include interagency watershed training and skills classes, workshops on regulatory processes, and development of appropriate outreach materials (e.g., how-to handouts).

By December 1999, establish a local stewardship award for fish-friendly watershed practices.

Coordinated Funding Cycles and Review Processes

The financing goal is to maximize the watershed protection and restoration opportunities available to funding applicants such that more on-the-ground watershed activities can occur in complementary, not duplicative, ways. To improve efficiencies and streamline funding processes for applicants, actions will be taken to coordinate the funding sources and cycles of the various watershed protection and restoration programs (see Appendix L). Efforts will be made to combine similar

funding programs in the areas of watershed planning, assessment, restoration, protection, education, and monitoring.

Specific actions include, but are not limited to, the following:

Action: By March 1999, establish a taskforce of funding program managers to carry out recommended actions.

By June 1999, have the taskforce recommend processes for combining relevant programmatic requests for proposals and coordinated review of grant applications.

By September 1999, implement recommended funding process.

Project Tracking

The coordination of watershed programs requires a better understanding of what watershed protection and restoration projects are currently being funded. It is also important to know where these watershed activities are occurring, and who is doing the work. The Natural Resources Project Inventory (NRPI) is an on-line directory of projects that includes those projects funded through our various state-funded programs.

Action: By March 1999, establish NRPI as the clearinghouse for all current and future state-funded watershed projects.

By June 1999, require all funded watershed protection and restoration projects to document information about their project using the NRPI forms as a condition of the grant.

By July 1999, secure funding from the various watershed protection and restoration programs to provide for the continued input of new project information and the maintenance of the NRPI system.

State-Level Efforts

This dimension of the program addresses activities for which protection responsibility primarily lies with the State, such as forest regulations, water quality protection and pesticide regulation, as well as the State role in funding assistance. Before describing the resource and program specific efforts, we first describe several broader state level issues and efforts.

A Steelhead MOU with NMFS: In March 1998, the State signed an MOU with NMFS regarding a series of conservation commitments to provide greater protection for steelhead in two Northern California regions proposed for listing under the ESA. As part of the MOU, the State and NMFS jointly committed to undertake a review of the adequacy of California's conservation programs. An independent science panel and the three advisory committees to the WPRC will assist in this effort. Based on these commitments, NMFS did not list these two regions. The joint review effort is now underway with an initial focus on California's Forest Practice Rules and their implementation.

Steelhead Plan: Since 1981, the Department of Fish and Game has spent more than \$80 million for restoration of salmon and steelhead resources through its habitat restoration grants program. The public-involvement aspect of this program, wherein interested and concerned citizens are provided an opportunity to participate in restoration of salmon and steelhead resources, is a key element of this program. Funds are granted to public agencies, nonprofit organizations, native American groups, and private entities.

These projects range from placement of spawning gravel and flow-control structures designed to increase fish habitat in streams to construction of fish ladders. Cooperative salmon and steelhead rearing programs also have received funding, although emphasis is placed on restoring instream habitat. The cost of individual

projects varies from less than \$1,000 to several hundred thousand dollars.

As with other elements of salmon and steelhead restoration efforts, funding for the grants program has been sporadic and often short-lived. The passage of SB 271 last year will result in about \$7 million per year over the next six years being available for this effort.

Program Funding: The major costs for a watershed program approach will be associated with the conduct of watershed assessments, development of watershed plans, protection and restoration activities, monitoring, education and outreach, and providing technical support. The following principles should guide the funding of the WPRC Program.

- There should be a partnership between landowners and the public in financing the implementation of the Program
- Landowners should be responsible for cost-sharing Program implementation to the degree that it serves as their means to meet their existing legal responsibilities
- Consistent with the Cumulative Wildlife Impact Report for the Board of Forestry, State and federal government should strive to either provide or help finance the basic watershed analysis to support development of a watershed plan in areas dominated by small ownerships
- The public should help finance restoration work that is not otherwise required by law
- State and federal agencies should cost-share technical support services wherever possible.

In the last two State budgets, annual State investments in coastal watershed efforts have been increased over \$11 million. In January 1997, Governor Wilson proposed in his budget a Watershed Initiative to fund additional technical and financial resources for community-based watershed efforts.

Through negotiations with the Legislature, a six-year, \$43 million program was approved in September 1997. This currently provides \$8 million per year.

Additionally, the 1998 budget includes: 1) a \$1.4 million for 14 new positions solely for Timber Harvesting Plan (THP) review (four to DFG, three to Department of Mining and Geology, four to the RWQCB and three to CDF for post-harvest monitoring and upslope review; 2) CDF has received \$120,000 and two positions to assist landowner groups in performing watershed assessments and providing watershed information; 3) DFG received a \$1.4 million augmentation to fund the monitoring effort agreed to in the State-NMFS MOA; 4) a shift in funding support for CDF's THP review process from Forest Resources Improvement Fund (FRIF) to the General Fund. As a result, approximately \$8.4 million in FRIF is available for other FRIF-related programs, including watershed assessments.

The Governor also proposed a longer-term funding source as part of his 1998 budget. Traditionally, California has utilized bonds to finance larger, longer term investments. Governor Wilson proposed \$100 million for watershed protection and restoration as part of a larger water bond. Final agreement could not be reached with the Legislature in time for placement on the November 1998 ballot.

While the WPRC Program is designed to make financial assistance available to local government and community-based groups, the State can only provide a portion of the total resources needed for this effort. The State recognizes that additional resources will be required. The magnitude of watershed problems cumulatively contributing to depleted species populations and degraded water quality will require hundreds of millions of dollars of restoration investments over several decades. This will require a funding partnership between State, federal, local government, private landowners and non-profits.

Governor Wilson has joined with the Governors of Oregon, Washington and

Alaska in a joint request for a full federal partnership in funding the needed watershed approach to protection of anadromous salmonids. As they noted in a letter to Vice-President Gore:

“We recognize that restoring salmonid populations requires enhancing our regional cohesion and capacity to respond. This will require additional resources, common regional goals and principles, regional science-based guidance on broad-scale issues, and more regional coordination.

Key to this regional effort is the creation of a new federal fund to complement new state funding. This fund will be critical to increasing our ability to leverage other resources and commitments, and to help finance existing and dramatically expanding salmonid conservation and restoration needs. We would like to work with you on this proposal and request your help in establishing this fund and building it into the FFY 2000 budget.

Generally, we are proposing that fifty million dollars a year over and above existing federal funding would be provided to each state for each of six years, equivalent to one chinook and two coho lifecycles. These funds would be provided to the governor's office in each state to be used for salmon conservation and restoration activities including planning, protection, restoration, and other regional conservation measures. A flexible nonfederal match would be required.

Projects and activities funded within each state would be consistent with a science-based approach including:

- Scientifically sound watershed assessments
- Watershed plans and projects prioritized based

upon these watershed assessments

- Implementation of projects consistent with these watershed plans
- Monitoring, evaluation, and plan refinement
- Local government or community organization coordination, outreach, or education that directly supports these activities
- Research into chronic nearshore and estuarine impacts to salmon
- Addressing regional biological factors reducing salmon survival
- A majority of funding is allocated for on-the-ground projects.

Science must play a key role. State science panels have been established in each state to guide recovery and conservation activities. A regional science panel would also be created to review regional results, provide regional guidance on broad-scale restoration and research priorities, and address potential interjurisdictional and transboundary habitat concerns and other regional biological issues.

We will use performance-based monitoring to evaluate our success in implementing conservation and restoration. Each state will provide an annual report to Congress on the use of these funds and the results of conservation and restoration activities. We will also convene periodic meetings to review regional progress on salmon conservation and restoration and report on these.”

Watershed Governance: A significant challenge in making a transition to a watershed approach to reconciling economic and environmental values is the fragmented governance system now in effect. An excerpt from a recent study of

this issue for the State of Minnesota describes this challenge of national scope:

Emerging Approaches To Watershed Governance

The United States has spent decades creating and recreating governance systems and institutions to manage economic and social well-being in changing environments. This has not been the case for environmental issues in general, and watershed issues in specific. Over thirty years ago, we adopted the command-and-control approach as our primary environmental governance system, and a set of fragmented institutions emerged to administer it. Despite the notable successes that this system can claim, the type, scale and complexity of environmental issues have changed dramatically since then, as have the economy and the public's views of how resource issues should be managed. Yet, most of our watershed governance systems and institutions have remained relatively static.

The challenges faced by many watershed programs and institutions today - including those in Minnesota as described in the excellent 1996 report entitled *Crosscurrents* - should, therefore, be viewed as part of a natural evolution from our early-stage command-and-control system to more integrated approaches to watershed governance. Research on organizational change shows that sound, effective and efficient management systems often emerge only after many years of ad hoc confusion and piecemeal efforts. This underscores that the search for new governance systems is a natural outgrowth of our increasing knowledge about the way watersheds function, the management of complexity, and the design of high performance organizations.

This Report makes specific recommendations on needed coordination mechanisms to address this challenge. We encourage responsible experimentation to explore better ways to integrate or re-align existing governance to better support watershed level efforts.

Water Rights

Overall improvements in the SWRCB's water rights program are guided by the Board's Strategic Plan, updated in 1997. The most relevant improvements planned and underway relate to compliance activities and the development of more protective water rights permit terms.

Compliance activities: It does little good to develop permit/license terms to protect fishery resources if water users do not comply with these terms and follow-up surveillance and enforcement is not pursued. Many administrative tools exist to encourage compliance once non-compliance is detected, however, use of these tools has been limited in the past due to other priorities and available staff resources. With the addition of six new staff positions in FY 1998-1999 for water rights enforcement, greater levels of compliance will be achieved.

Permit requirements: The SWRCB has been developing new criteria requirements to protect fish habitat from small and moderate water project development in streams, which may support anadromous fish. The SWRCB has about 600 pending water right applications. Most of these are for small projects (less than 200 acre-feet of storage or 3 cubic feet per second direct diversion). About half of the pending water right applications are in coastal watersheds. Concerns related to the individual and cumulative impacts of many small projects on the habitat of anadromous fish have also been expressed in recent years. Several of these fish species have been listed under the federal ESA as threatened or endangered. The following issues are being addressed by proposed requirements:

- Bypass flows
- Season of diversion
- Prevention of migration barrier/offstream storage
- Fish screens
- Limited rate of diversion to protect stream processes.

SWRCB staff is proposing that the following requirements be considered in all coastal watersheds where steelhead trout or coho salmon habitat needs to be protected. These requirements will be applied on a case-by-case evaluation of the specific circumstances and the need to protect fish habitat. Specific impacts unique to a water development project will also be evaluated during the environmental review process.

Bypass flow: Water diversions, as discussed in Chapter 3, can affect fish habitat in many ways. On the north coast of California there are four rather detailed instream flow incremental methodology studies that were conducted on the flow needs for steelhead and coho. Flow requirements for steelhead are typically greater than those for coho. Additionally, the geographic range for steelhead includes the range for coho. A 1997 SWRCB staff report found a general relationship between the flow needed for optimal spawning and rearing habitat and the average unimpaired flow at the location of concern. Typically, flows that protect spawning are around 60 percent of the average annual unimpaired flow, while flows needed for rearing are about 30 percent of the average annual unimpaired flow. These general rules may be useful for streams with relatively small diversions and allow the development of protective bypass flow requirements. For large projects, site-specific studies are needed to evaluate appropriate fishery bypass terms.

Season of diversion: The season of diversion for a new water right is based upon the local runoff and hydrologic situation combined with the water demands of prior rights and the flows needed to remain in the source for the protection of

fish and wildlife. Water availability analyses have been conducted for several coastal streams using the bypass flow requirements for steelhead set forth above. In order to protect early migration flows, SWRCB staff has recommended that water for new projects not be appropriated before December 15. This prevents the further depletion of flows during early winter storms that benefit migration for both coho and steelhead. Using dry year hydrology and the needed spawning flows identified above, the allowable diversion typically runs to around the end of March. This may vary from stream to stream, based on local hydrology and the amount of water diversion by existing projects. During the remainder of the spring, summer and early fall, natural stream flow in coastal streams is not typically sufficient to meet the rearing flows identified as needed for coho and steelhead. This indicates that under natural conditions these flows may have limited the population size of these species. These limiting conditions should not be further reduced by new appropriations. Therefore, water should not be considered available for appropriation during these periods unless specific studies are available to indicate that additional water diversions can take place without adversely affecting steelhead or coho habitat.

Prevention of migration barriers:

Barriers to the migration of steelhead and coho are a major concern. A relatively small barrier in the form of an onstream dam can eliminate several miles of productive stream habitat. Onstream water storage projects can also adversely affect the recruitment of necessary spawning gravel downstream. New water projects must avoid the elimination of steelhead and coho spawning and rearing habitat or adverse effects on gravel recruitment. The use of offstream storage projects, in addition to limiting the season and rate of diversion, is another way to reduce the environmental effects of new water storage projects. The location of these projects should avoid affecting the access to significant upstream fishery habitat and the flow of necessary spawning gravel.

Fish screens: The requirement for fish screens is a typical water right permit term in cold water fish streams in response to the requirements of the Fish and Game Code. For small water diversions the technology is readily available to reduce the numbers of fish being entrained into the diversion works or being impinged upon the screen itself. Both DFG and NMFS have developed consistent fish screening criteria to be used for small to moderate diversions. For large diversions the criteria still apply but the actual design of the fish screen may be more complicated. Requiring a fish screen acceptable to the DFG should continue to be a requirement in all water right permits.

Limited rate of diversion: The rate of the water diversion is often more important than the annual amount of water diverted. Fish respond to instantaneous events. Rapid rates of diversion affect the approach velocities at the water diversion intake, which affects fish screen efficiency. Also, if a diversion is large relative to the stream flow, it can extract the peak flows that are important to stream channel formation or the movement of sediment or gravel throughout the system. Determining the flows necessary for these fluvial processes is often complex and requires specific study. Large projects that can affect these flows need to be separately evaluated. For small projects, one way to prevent such impacts is to limit the rate of diversion to a small fraction of the stream flow during water availability events. One mechanism being evaluated is to limit the rate of diversion to a percentage of the unimpaired flow near the diversion works. The exact rate should depend on the possible cumulative effects of this project and other previous and future project effects on the flushing flows in the area of the water intake and downstream areas.

Water Quality

Overall efforts to improve SWRCB and Regional Board water quality programs are guided by the Boards' Strategic Plan,

updated in 1997. The Plan, as adopted in 1995, set the course for improvements in programs based on a watershed approach. Subsequently, the Boards have further charted the course for improvements through the Integrated Plan of the Watershed Management Initiative (approximately 2000 pages). Both the Strategic Plan and the Integrated Plan are available upon request.

Specific improvements in water quality programs can be presented by program or activity, by watershed or water body, or by overall Strategic Plan directions. Strategic Plan directions take the form of all-encompassing management initiatives directed at increasing the capacity of all programs to address issues through efficiencies and coordination, ensuring that protective standards are in place, increasing compliance with water quality laws, and reducing transaction costs and time associated with obtaining permits and approvals. In the interest of space, the following presents a mix of strategic directions and activity-related improvements.

Increasing the Effectiveness and Coordination of Water Quality

Protection Programs: To ensure that water quality programs continue to provide water resources protection, enhancement and restoration while balancing economic and environmental impacts, the Watershed Management Initiative (WMI) was launched through the SWRCB/ Regional Boards' Strategic Plan in 1995. The WMI deploys a strategy to draw solutions from all interested parties in a watershed, more effectively coordinate programs and implement measures to control both point and nonpoint sources.

Each Regional Board has prioritized watersheds in its region and developed initial watershed management strategies. These strategies are contained in a June 1998 Integrated Plan for Implementation of the WMI. Relevant activities are outlined at length in the Integrated Plan which is available upon request.

The FY 1998-99 budget provided a WMI coordinator at each of the Regional Boards

and the SWRCB to provide outreach to local stakeholder groups and help guide solutions to water quality problems. These staff will coordinate with other governmental agencies and programs and assist local groups to protect their local watersheds. This process is just beginning and currently is limited to the higher priority watersheds.

In mid-1998, the Clinton Administration initiated the federal Clean Water Action Plan (CWAP) which proposed additional federal funding and coordination of federal programs (the level of funding for each federal fiscal year of the five-year program is contingent on final action by Congress). A cornerstone of the Plan is the deployment of watershed approaches and additional funding. The work completed under the WMI placed California in a superior position to take advantage of any new resources which may become available. In October 1998, state and federal efforts to produce a Unified Watershed Assessment culminated with the identification of priority watersheds where potential new federal funds will be directed.

In 1999, the SWRCB will continue to work with the California Coastal Commission, U.S. EPA and the National Oceanic and Atmospheric Administration to develop and implement a 5 and 15 year implementation plan and strategy to bring California into conformity with the federal Coastal Zone Act Reauthorization (CZARA).

Using Best Science - Water Quality

Standards: As science continues to increase our understanding of the effects of pollutants and our ability to detect pollutants, revisions in water quality criteria (standards) continues. U.S. EPA is in the process of promulgating the California Toxics Rule (CTR) which establishes water quality criteria for priority toxic pollutants for inland waters and enclosed bays and estuaries in California. In parallel, the SWRCB is preparing a statewide policy for implementing the criteria and statewide toxicity control provisions. The draft policy, released for public comment in September 1997, represents Phase 1 in a two-phase process to adopt new water quality control

plans for inland surface waters (ISWP) and enclosed bays and estuaries (EBEP). Phase 1 should be completed in early 1999. Phase 2 will involve the establishment of state-adopted water quality objectives for the priority pollutants included in the CTR and the incorporation of the Phase 1 policy in an ISWP/EBEP. SWRCB will consider adoption of the draft policy after the U.S. EPA criteria become final.

For the California Ocean Plan, SWRCB staff is investigating the use of narrative and/or numeric biological water quality objectives based upon aquatic community structure, community function, diversity and population densities. Public hearings conducted in late 1998 will further define issues.

The Thermal Plan, first adopted by SWRCB in 1971, has not been reviewed since 1975. Several issues have emerged which now make a thorough review of this Water Quality Control Plan timely. Among these are the need for updates to reflect changed State and federal laws and regulations, and new scientific information about the thermal needs and requirements of various aquatic species and communities, including threatened and endangered salmonid species. The SWRCB started to review the Thermal Plan at a hearing in August, 1998 and it is expected to culminate with amendments to the plan in two years.

While Regional Boards believe that their standards and the permits that are adopted pursuant to those standards are protective of endangered and/or threatened aquatic species, some standards may not be explicit enough to satisfy NMFS with regard to the recent listing of coho and steelhead as threatened in parts of California. The North Coast Regional Board will be reviewing its standards and regulatory framework in the Russian River watershed for compliance with a "no take" provision under the federal ESA. Close coordination and consultation with the U.S. EPA and NMFS by the North Coast Regional Board in the review will point out those standards which may need revision or modification to satisfy NMFS as "no take" per federal ESA. Subsequent modification by the North Coast Regional

Board would ensure that permits issued pursuant to those standards would constitute "no take." Other Regional Boards will be able to use the results of that review.

Ensuring Compliance and

Enforcement: Compliance with environmental laws and regulations is enhanced by regulatory programs which assist dischargers in understanding the rules. When violations occur, enforcement follow-up provides disincentives to potential violators and establishes a level playing field so that those who comply with the law are not put at a competitive disadvantage with those who violate the law. The SWRCB and the Regional Boards are continuing to develop and implement enforcement measures to assure compliance through increased efficiencies and field presence.

Recent progress includes the following:

- Issuance of the Water Quality Enforcement Policy and Guidance
- Increased enforcement staff (18 staff in FY 1997-98, and 11 staff for 1998-99, including 6 staff for water rights)
- Designation of enforcement coordinators at each Regional Board
- Routine enforcement coordination roundtable meetings
- Participation on local enforcement task forces to coordinate enforcement on multi-media violations and to assist in the development of criminal cases
- Assessment of Regional Board enforcement activities
- Development of a strategy to guide future efforts
- An increase of enforcement actions on the order of 50 percent over previous years.

The direction of future efforts is set out in the SWRCB's Compliance Assurance and Enforcement Strategy (Strategy) and improvements will continue.

Streamlining Processes: Permit streamlining efforts by the SWRCB and Regional Boards are focusing on the three

phases of the permitting process: pre-application, application submittal, and application processing. The use of customer service surveys provides feedback on the order of improvements and where success has been achieved. The following discussion provides examples of the direction of these efforts.

1. **PRE-APPLICATION:** Making it easier for dischargers to understand the who, what, when and where of permitting.

Making what we have more accessible:

All compliance assistance and guidance materials have been gathered from the Boards' 14 office locations and consolidated in a library at the SWRCB. A 15-page listing (outreach, procedures, references, forms, technical guidance, etc.) has been published and distributed on the internet. A few examples of the materials listed follows:

- A Business Person's Guide to the San Francisco Regional Water Board (a Citizen's Guide was also published)
- Wetlands Permitting Handbook
- Storm Water Fax, Hotline and Bulletin Board
- Storm Water Discharge Permits - Information Newsletters
- Flow charts for processing permits
- Dairy WDR application packet (and 12 other industries).

Internet sites giving electronic access to information have been established for the State Board and five Regional Boards.

The "Water Contacts Directory" was published to give the public the direct telephone number of staff experts in various programs.

Going to where the customers are:

Regional Boards have provided staff for twelve permit assistance centers. Additionally, Water Board ombudsmen participate in statewide Cal/EPA Ombudsman Forums to inform stakeholders of recent changes in environmental laws and programs.

Filling the information gaps: Outreach has been increased; some examples follow:

- Storm Water Questions and Answers Brochure
 - "Do I Need A Permit?" brochure features six critical "need to knows"
 - Questions and Answers for California's Dairy Operators.
2. APPLICATION SUBMITTAL: Increasing the applicant's efficiency in submitting a complete application.

Making it clearer what we need in an application: In addition to increasing the availability of guidance materials mentioned above, the Board's standard application form (Report of Waste Discharge: Form 200) has been revised, guidance has been expanded and all has been placed on the internet.

Creating a single point of contact for revenue collections: A single purpose fee unit was established at the State Board to centralize issues associated with permit fees and billings. This has resulted in increased accuracy in billings, regular and predictable billing cycles and quicker responses to inquiries and problems. The schedule of fees for all permits was published and placed on the internet.

Defining expectations: The Cal/EPA Bill of Rights for Environmental Permit Applicants, which defines processing times etc. was developed and is available to all applicants.

3. APPLICATION PROCESSING: Decreasing the turn-around time in processing a complete application.

Bill of Rights follow-up: State Board staff conducted follow-up training for the Regional Boards to achieve the intent of the Bill of Rights for Environmental Permit Applicants. State Board staff track and monitor the permit processing performance of each Regional Board. Conformity with the published processing times has improved.

Tiered Permitting: The State and Regional Boards apply three types of

permits for regulating discharges: waivers, general permits, and individual permits.

- Waivers are typically used for de minimus situations. Consistent with the de minimus situation, waivers involve the least paperwork.
- General permits have come into vogue in the 1990's. These permits apply to a specific activity, such as dairies and the post-closure maintenance of inactive landfills, and allow the applicant to enroll into an existing approved general permit. From the handful of general permits issued before 1990 we now have 54 such permits covering approximately 1400 enrolled dischargers. Additionally, with implementation of the stormwater permit program, approximately 12,000 dischargers are enrolled in two general permits for stormwater. Increasing the use of general permits continues; a general permit for biosolids is currently being developed by the State Board. Consistent with the expected similar consequences of like discharges, general permits reduce paperwork through a "one permit fits many" approach.
- For individual permits, work is progressing on establishing standardized permit language to be used by all regional boards. While permits must be different to account for differing environments, similarities can be addressed with standard language. For example, the federal Subtitle D Program (Municipal Solid Waste Landfills) was implemented with State Board boilerplate language in permits issued by regional boards for all subject sites. Consistent with the complexity and threat of the discharge situation, individual permits more closely fit unique situations.

Storm Water Discharges: Efforts will continue to reissue the statewide construction permit (land disturbance of five acres or more), the statewide permit for Caltrans, follow-up on nonfilers and gear-up

for Phase II of the federal storm water permit program.

U.S. EPA is developing phase II of the NPDES Storm Water Program. Phase II may increase the reach of municipal storm water permitting to include all urban areas (as defined by the Census Bureau) and construction projects which disturb between one and five acres. This change is estimated to affect 110 additional communities in California and an unknown number of construction sites.

Caltrans urban areas are currently permitted under nine separate NPDES Permits, as well as the Construction General Permit. Caltrans has applied for a statewide NPDES storm water permit to cover discharges of storm water from highways and highway related facilities. The permit will address design, maintenance and construction activities within Caltrans jurisdiction. It is anticipated that Caltrans will be issued a permit early in 1999.

Caltrans has developed a statewide Storm Water Management Plan in conjunction with an application for a statewide storm water permit. These documents in conjunction with the statewide permit define Caltrans commitments and statewide program for reducing the discharge of pollutants from the storm water drainage systems that serve Caltrans highways and highway-related properties, facilities and activities. To implement these programs, BMPs have been developed and are contained in four storm water quality handbooks: Planning and Design Staff Guide, Construction Staff Guide, Construction Contractors Guide, and Specifications. Training has been conducted throughout the state.

Caltrans has developed manual Maintenance Staff Guide to address the implementation of storm water BMPs during highway maintenance and activities conducted at maintenance facilities. A training program has been developed and training will take place this year.

Instream Activities: In the San Francisco Bay Area, a cooperative approach called the

“Long Term Management Strategy” (LTMS) for dredged material has been undertaken. The lead agencies include the Corps, U.S. EPA Region IX, San Francisco Bay Regional Board, San Francisco Bay Conservation and Development Commission, the SWRCB and the Central Valley Regional Board. The goals of LTMS are to conduct dredging and the beneficial reuse and disposal of dredged material in an environmentally and economically sound manner. The LTMS seeks to maximize reuse of dredge materials and to establish a cooperative framework for dredging permit applications. LTMS is working with the Central Valley Regional Board on the use of dredged material for levee restoration, wetland construction, shallow water habitat and shaded riverine habitat in the western portions of the Sacramento-San Joaquin River Delta. The LTMS EIS/EIR was released in October 1998.

The Central Valley Regional Board is in the process of developing general water discharge requirements to address various types of dredging activities and dredged material disposal and beneficial reuse alternatives. This process has solicited comments from the Resource Agency’s Delta Levee and Habitat Advisory Committee and DWR’s Central District, Special Projects Section. Issues that remain to be addressed include landside and waterside sediment quality criteria or guidelines, level of protection for beneficial uses, point of compliance for BMPs, cost sharing and prioritizing beneficial reuse alternatives. The future of these activities is uncertain due to resource constraints.

Under the Bay Protection and Toxic Cleanup Program (BPTCP), the SWRCB and the Regional Boards are conducting detailed assessments of levels of pollutants in sediments. In the San Francisco Bay Area, the BPTCP is generating new data on “background” conditions that will enable regulators to better evaluate water quality impacts associated with dredging in the bay.

Confined Animal Facilities: In response to increased scrutiny of confined animal feeding operations in California and a lack of consistent educational and voluntary

compliance assistance, a partnership has been formed between federal and state regulators, the University of California, and California dairy industry. The partnership is a cooperative effort between the California Dairy Quality Assurance Program (CDQAP), the University of California Cooperative Extension (UCCE), the California Department of Food and Agriculture (CDFA), the California Environmental Protection Agency and the State Water Resources Control Board (SWRCB), the California Resources Agency and Department of Fish and Game (DFG), Region 9 of the United States Environmental Protection Agency (U.S. EPA), and three organizations within the United States Department of Agriculture: Animal Plant Health Inspection Service (APHIS), the Natural Resources Conservation Service (NRCS) and the Farm Services Agency (FSA). Industry associations include: California Dairy Campaign, California Dairy Research Foundation, California Farm Bureau Federation, California Milk Advisory Board, Milk Producers Council, and Western United Dairymen.

The purpose of the partnership is to support the Environmental Stewardship component of the CDQAP as a voluntary, cooperative government and industry education/certification program. The program's objective is to assist California dairy producers in meeting all federal, State, regional and local requirements relating to manure and nutrient management. The program's ultimate goal is to help ensure a healthful environment for the people and wildlife of the state of California. The program core components include continuing education workshops for producers, the creation of Environmental Stewardship Farm Management Plans tailored to each dairy, and on-site evaluation by a third party.

Industry participants in the Environmental Stewardship component of the CDQAP are required to complete the Environmental Stewardship Short Course and a Environmental Stewardship Farm Management Plan tailored for each dairy. Once those are complete the dairy can call for an onsite evaluation by a third party inspector to verify compliance. The

following describes the short course and components of the proposed management plan:

Environmental Stewardship Short Course -

Each producer (or authorized employee representing the dairy) must complete a workshop in environmental stewardship developed or approved by University of California Cooperative Extension (UCCE). Workshops will be held at various locations throughout the State and conducted by UCCE trained staff. Certificates of completion will be provided and records of attendance kept by UCCE. The curriculum is reviewed with partners in their areas of regulatory authority to make sure current laws and regulations are addressed.

Environmental Stewardship Farm

Management Plan - Each producer (or authorized employee representing the dairy) will complete an Environmental Stewardship Farm Management Plan and other associated documents tailored to his or her dairy.

Implementation: As of October 1998, over 900 dairy operators have attended the "Environmental Short Course." The CDQAP has set a goal of reaching 50% of the dairies in California by Spring of 2000 with the "Environmental Short Course." Beginning in November 1998, the California Department of Food and Agriculture will be facilitating a six month pilot project, with all partners and other interested parties, to develop policies and procedures for the program, e.g. the third party inspection. At the end of the pilot project, a set of recommendations will be forwarded to the partners for their concurrence. Implementation of the full program is expected in Fall of 1999.

Pesticides

The Department of Pesticide Regulation (DPR) registers pesticides for sale and use in California and regulates their use. DPR has or is currently developing several programs that address issues concerning pesticides and surface water. These programs can assist to identify whether

pesticides are a significant stressor in individual watersheds, as well as to develop and implement measures to mitigate problems that may be caused by pesticides.

DPR recently issued a set of 56 Endangered Species Interim Measures County Bulletins for Insecticides that specify protection strategies for federally listed anadromous fish including coho salmon, chinook salmon and steelhead trout and 34 other federally listed species where insecticides are used in protected watersheds. The bulletins are part of the U.S. EPA's Endangered Species Protection Program and are supported by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. The bulletins are currently being distributed by county agricultural commissioners to growers and pest control applicators and are available on the Internet at www.cdpr.ca.gov under the "endangered species" menu item.

Grants: DPR administers two competitive grant programs that assist individuals and groups to develop and implement reduced-risk pest management programs. Both grant programs give priority to projects that protect surface and groundwater from contamination by pesticides.

Pest Management Alliance Grants: The Pest Management Alliance is a \$750,000 grant that supports larger scale efforts in applied research and demonstration projects for integrated pest management. IPM stresses the application of biological, mechanical, and cultural pest control techniques. Successful proposals may involve applied research, demonstration projects, or a combination of the two. Projects also must serve as a practical model for adoption of new pest practices throughout an industry and across the state. Applicants may receive up to \$100,000 with the possibility of a second year renewal. Applicants must match the grant.

In 1998, three grants targeted protection of surface water:

- The Walnut Marketing Board, Sacramento, received \$100,000 to

develop reduced-risk pest control and reduce or eliminate surface and ground water contamination.

- The California Prune Board, based in Fresno received \$50,000 to expand and strengthen existing reduced-risk pest management strategies and improve communication and cooperation among different segments of the industry. The project also seeks to reduce or eliminate surface water contamination from insecticides used in dormant sprays.
- The Almond Board of California, based in Modesto, received \$99,000 to promote a reduced-risk system of almond production through use of alternative products and practices, actual on-site demonstrations, and grower education. If widely adopted, alternative practices could help reduce pesticide runoff into the Sacramento and San Joaquin watersheds.

Pest Management: The Pest Management Grants program awards grants for projects aimed at developing reduced-risk methods of controlling pests. Funding has been available for demonstration and applied research projects in both agricultural and nonagricultural pest control. Grants are available from \$10,000 to \$30,000 per year. Funding is for one year, but may be renewed for two additional years based on performance. In 1998, Approximately \$500,000 is available for demonstration projects, and the remaining \$250,000 for applied research. Priority demonstration projects include agricultural and nonagricultural pest management projects that address the protection of surface and ground water quality. Proposals are screened by the Pest Management Advisory Committee which recommend to DPR which proposals should be funded.

Examples of funded projects which protect surface water include:

- Biologically Integrated Prune Systems in the Upper Sacramento Valley.

After three years, participating growers have reduced application of dormant insecticides on all acreage in the project, thus significantly reducing the potential for contamination of surface water.

- Central Contra Costa Sanitary District. Public outreach and education program to encourage gardeners to use less toxic materials for home pest control in order to protect the San Francisco Bay and local rivers.

The Requests for Proposals for these programs are statewide in scope. Rather than watershed-specific. However, these programs could serve as a model for watershed-specific programs, for areas where pesticides are identified as an issue of concern.

The grants programs have been funded through a combination of federal funds, a special assessment on foods for processing, the Department of Pesticide Regulation Fund, and a one-time legislative appropriation. There would be a need to secure stable funding sources for additional watershed-specific programs.

Pesticide Management Plan for Water Quality:

The California Pesticide Management Plan for Water Quality is a joint effort by DPR) and the SWRCB to protect water quality from the potential adverse effects of pesticides. It describes how DPR and the County Agricultural Commissioners (Commissioners) will work in cooperation with the SWRCB and the Regional Water Quality Control Boards ensure that legal use of pesticides does not adversely affect water quality. The Plan contains provisions for outreach programs, compliance with water quality standards, ground and surface water protection programs, self-regulatory and regulatory compliance, interagency communication, and dispute and conflict resolution.

DPR, in cooperation with the SWRCB, is currently developing specific plans for implementing critical elements of the Plan. These include:

Collection and evaluation of surface water monitoring results:

DPR is developing a relational database of results of DPR's surface water sampling for pesticides and biotoxicity test results for scientific and regulatory purposes. Qualifying data from other state agencies, private firms, and organizations will also be included in the database. Data contained in the database may be used for (1) fulfilling mandates, (2) designing monitoring programs, (3) identifying areas where reduced risk practices should be implemented, (4) exchanging information with other agencies, the public, and private firms, (5) developing or revising statutes and regulations relative to pesticides and water quality, (6) formulating policies and management plans, (7) implementing, in part, the Management Agency Agreement between DPR and the SWRCB, and (8) an archive of information on California surface waters that have been sampled for pesticides.

The database will include data from samples collected in fresh, estuarine, and saline waters of the state, including rivers, streams, canals, ponds, lakes, bays, estuaries, sloughs, runoff from fields, tailwater recovery basins, and agricultural drains. Sampling data for all pesticides currently or previously registered will be included.

Problem evaluation and mitigation:

DPR, in consultation with others as appropriate, will identify potential sources of the pesticide, compare levels of detection to established water quality standards or other appropriate values, and determine the need for and degree of mitigation measures.

There will be a three stage approach to mitigation:

- DPR will seek sponsors to direct local self-regulation implementation of mitigation measures. If progress is not satisfactory,
- DPR will exercise its regulatory options. These options could include

requiring permits for use of a pesticide, restricting use of the pesticide to certain conditions, or even suspension or cancellation is uses. If this is not satisfactory,

- SWRCB or Regional Boards may exercise their regulatory authorities.

For example, insecticides applied to dormant fruit and nut orchards have been detected in surface waterways of the Sacramento and San Joaquin valleys and in the Delta.

Concentrations periodically exceed those that are toxic to aquatic organisms. To address this issue, DPR currently promotes voluntary efforts to prevent aquatic toxicity, such as the Alliance Programs.

Concurrently, DPR is monitoring the Sacramento and San Joaquin river watershed to check compliance with water quality standards. As long as progress continues toward compliance with water quality standards, regulations will be unnecessary. A thorough evaluation of the Dormant Spray Water Quality Program will occur after the 2000-2001 use season. If at that time, aquatic toxicity persists from dormant sprays, DPR will impose regulatory controls to lower dormant spray residues to acceptable levels.

The next steps in implementation of the Plan for DPR include developing criteria for:

- Determining if monitoring data are valid based on completeness and quality
- Determining if water quality standards or goals are not being met
- Determining if the presence of pesticides is the result of legal use
- Working with affected stakeholders to develop mitigation measures

DPR has redirected additional resources toward implementation of the Plan. However, this is only a short term remedy as redirection mean that other important activities are temporarily being postponed. DPR is exploring ways to obtain additional resources for implementation of the program.

Pesticide Use Report (PUR): California requires that all agricultural uses of pesticides must be reported to DPR.

Pesticide use that must be reported not only includes chemicals used on crops but also applications to such sites as parks and golf courses, as well as roadside weed control treatments. In addition, all applications made by residential and structural pest control businesses must be reported. The primary exceptions to the use reporting requirements are nonprofessional applications in homes and gardens, and in most industrial and institutional settings.

This information is compiled into a database known as the Pesticide Use Report (PUR), issued annually. Records from the PUR can be combined with other databases, such as geographic descriptions of watersheds, to determine when, where, and how much has been applied. This information can be used to evaluate which pesticides may be of potential concern to a specific watershed.

The PUR is currently available as a printed report or on CD ROM. In order to fully use the CD ROM version, however, users must develop their own computer program for sorting. There is a need to make the PUR more widely available and easier to use. DPR is exploring options for this, including making the report available through the Internet.

Forestry Activities

Most forestry activities are regulated through the Z'berg-Nejedley Forest Practice Act and subsequent review of timber harvesting plans (THPs) by the Department of Forestry and Fire Protection. Timber harvesting activities must also comply with the California Environmental Quality Act, Porter Cologne Water Quality Act and its Basin Plans and the Endangered Species Act.

In any forested watersheds that currently support populations of anadromous salmonids, or wherever such populations can be restored, several principals are key in conducting activities, such as:

- Where sediment is a limiting factor, cause no net sediment load increase to the stream system
- Cause no decrease in stream bank or channel stability
- Cause no blockage of salmonid migratory routes
- Cause no stream flow reductions during critical low water periods
- Protect, maintain, and restore trees, snags, or downed logs that currently, or may in the future, provide large woody debris recruitment needed for instream habitat structure and fluvial geomorphic functions
- Protect, maintain, and restore the quality and quantity of vegetative canopy needed to provide shade to the stream and to provide hiding cover and a food base.

Within forested watersheds, a number of land use activities can occur that can all have impacts on the salmonid resource. The State deals with these in different ways. For example, in the case of timber operations, the following kinds of considerations are examined in the context of preparing THPs:

- Historical land use effects on salmonids probably exist and need to be analyzed and mitigated
- Attention to, and proper management of, upland areas most likely will avoid direct and cumulatively significant impacts
- As the forest management system and harvesting practices used near streams (most notably in Watercourse and Lake Protection Zones) may have a strong affect on salmonid habitat, choice of silvicultural systems must deal with the need to protect, maintain, or restore salmonid populations and habitat as a primary objective
- Attention to and proper management of upland areas -- especially in roads and landings -- is vital to avoiding direct and cumulative significant

modification of salmon habitat impacts.

To a large degree, these observations are already being incorporated in the administration of the Forest Practice Rules and process. However, there is room for improvement. To this end, the Director of Forestry and Fire Protection appointed an internal Task Force in September 1998. Working mostly by conference call, it meets weekly. Its goals are to facilitate watershed level approaches to timber harvesting issues and to improve communication between Review Team agencies and others.

To date, the Task Force has worked with DMG, DFG, SWRCB, and the North Coast RWQCB to identify areas of improved cooperation. The Task Force also has identified several areas within CDF that can benefit from further review, including the coordination and use of GIS data and improving THP quality.

For DMG, the Task Force is exploring ways to improve the assessment of mass wasting and unstable areas, including the development of a training program for RPFs that will be consistent with State Laws governing the practice of geology.

The Task Force is also working with the Department of Fish and Game. DFG has announced a reorganization plan and DFG will be assigning a team of its staff from several new divisions to work with the task force. CDF has requested consultation from DFG that will lead to watershed level biological opinions that will assess the status of salmonids, identify limiting factors, and indicate the kinds of management measures that could address DFG concerns. This would be done in conjunction with ongoing THPs and could be used as a source of information to RPFs preparing plans as examples of a THP in each watershed that would meet DFG concerns. The coverage of watersheds will increase as DFG staff become available. The Task Force is also working to develop common training programs for CDF and DFG biologists that review timber harvest plans and ultimately for RPFs that develop THPs.

For the SWRCB and the North Coast RWQCB, the Task Force is working on joint GIS data base development. As a result of Task Force discussions, CDF has appointed an internal working group to be involved more strongly in TMDL development on the North Coast. CDF also will revisit concerns expressed by the boards over the existing Forest Practice Rules.

In addition, on March 11, 1998, a Memorandum of Agreement (MOA) was entered into between the State of California (Resources Agency) and the NMFS regarding North Coast Steelhead Trout.

Among the provisions of the MOA is a provision dealing with a California Watersheds Protection Program. Phase 1-A of this program calls for a Scientific Review Panel to:

- 1) Define properly functioning habitat conditions which adequately conserve anadromous salmonids, and,
- 2) Jointly review the adequacy of existing California Forest Practice Rules, including implementation and enforcement, to achieve properly functioning habitat conditions.

The Scientific Review Panel has been selected and has begun the task of evaluating the effectiveness of California's Forest Practice Rules.

The Fire and Resource Assessment Program (FRAP) of the Department of Forestry is conducting a coarse level assessment of watershed and stream conditions. The computer mapping program will identify stream and hillslope characteristics at a coarse regional scale. This assessment will evaluate differences between watersheds based on their physical characteristics which will help in identifying and targeting key stream reaches on the North Coast to assist in restoration activities.

Range Management

The Rangeland Water Quality Plan process is a voluntary process developed by range industry, conservation groups and State and federal agencies to comply with the State and federal Clean Water Acts, and the federal Coastal Zone Act Re-authorization Amendments (CZARA). The Rangeland planning process emphasizes the use of site specific management practices. The Plan process consists of the following elements:

- Assessment
- Management strategy
- Implementation of practices
- Monitor
- Adjust.

Both the State Water Resources Control Board and Environmental Protection Agency (EPA) Region IX have supported this approach. To date, plans for more than 300,000 acres of range land have been adopted. Landowners and supporting organizations (such as UC Extension, RCD's, the California Farm Bureau and the California Cattlemen's Association) are adapting this mechanism to serve new and broader purposes.

The Rangeland Water Quality Management Plan has the potential to be a significant element of the overall California Watershed Protection Program. As such, it could significantly contribute to providing the conservation commitment sufficient to enable NMFS and EPA to rely upon the State program as adequate to conserve anadromous salmonids and water quality.

We believe the existing legislative and programmatic framework, if appropriately implemented and funded, is adequate to address this issue. Effective implementation of existing authority and the program approach will require:

- Increased regional staff presence in watershed groups
- Increased application of the 3-tiered Nonpoint Source Program with enforcement as needed

- Expanded education and outreach effort
- Support for more demonstration programs
- Better documentation of the impacts of grazing on anadromous fish.
- Support landowners in the development and maintenance of water quality, watershed or habitat monitoring.
- Document the effectiveness of the program.

Coastal Watershed Pilot Project: Several state-wide landowner associations are asserting a leadership role in developing and implementing a pilot project to better support and utilize the Rangeland Water Quality Management Plan approach. They believe that putting nonpoint source controls in place on the ground is the best way private sector agricultural organizations can protect their members against overly burdensome, rigid, governmental management prescriptions.

Building on their work, the State proposes to utilize and strengthen the Rangeland Water Quality Management Plan approach. The goal is to provide range landowners an efficient means to satisfy the water quality standards of the State under the State's Porter-Cologne water Quality Act and State Basin Plans, the federal Clean Water Act, the federal Coastal Zone Act Re-authorization Amendments, and State and federal Endangered Species Acts.

Objectives of Proposal: The increased support for the Rangeland Water Quality Management Plan would:

- Help landowners and other stakeholders start watershed groups and facilitate group processes that achieve agreement on a course of action documented in a watershed plan.
- Support private landowners in the development of farm, ranch and watershed plans that address clean water, endangered species, wildlife habitat and other environmental issues.
- Provide technical support in the implementation and evaluation of management practices that reduce the impact of farm and ranch operations on clean water, endangered species and habitat.
- UC Cooperative Extension: Develop and conduct education, demonstration, and research programs that support development and implementation of individual property and watershed plans and monitoring programs that facilitate voluntary compliance with clean water and habitat protection requirements of law. Document the effectiveness of the program, including monitoring component.
- Resource Conservation Districts: The RCD's would organize watershed groups, seek funding to support projects, involve appropriate stakeholders, be the contact point for regulatory agencies.
- USDA Natural Resources Conservation Service: Provide technical assistance to landowners during the preparation and implementation of conservation, water quality and watershed plans. Help landowners acquire EQUIP funding to support conservation practices.
- California Farm Bureau Federation: The California Farm Bureau Federation's Nonpoint Source Initiative promotes the formation of

Overall, the intent is to better support and assist landowners in managing their lands consistent with protection of water quality and associated beneficial uses. The Rangeland Water Quality Management Plan was created as a voluntary option for landowners. This voluntary approach is the heart of Tier One of the State's Non-Point Water Quality Program. This proposal is consistent with that intent.

Under the draft proposal, agencies and organizations would support landowners and watershed groups as follows:

local watershed working groups of agricultural landowners, which would identify agricultural nonpoint source pollution water quality problems in their watershed and develop feasible, flexible controls. Through its Nonpoint Source Initiative, the Farm Bureau would continue to promote the use of the Rangeland Water Quality Management Plan for agricultural landowners. The State Farm Bureau would also work with appropriate governmental agencies and the UC Cooperative Extension to identify needed technical assistance, and certify assessment and monitoring protocols. With a farm and ranch family membership of 40,000 and county Farm Bureaus in 53 counties, Farm Bureau has the means to reach many of California's farmers and ranchers.

- California Cattlemen's Association (CCA): Having helped create the Rangeland Water Quality Management Plan, they would continue to promote and support its utilization. CCA would continue to promote Educational Workshops provided by UC Cooperative Extension and NRCS to educate producers on water quality concerns. These workshops have been conducted around the State starting extensively in 1996. Finally, CCA would continue to promote and support range management professionals being certified under the guidelines set by the California Board of Forestry.
- State and federal Agencies (CAL-EPA, Resources Agency, U.S. EPA, SWRCB, RWQCB, NMFS, F&WS, CDF, DFG, etc.): Several of the State and federal agencies have both statutory responsibilities and regulatory authority on water quality and species protection. These entities, however, are seeking creative, flexible and innovative approaches that incorporate cooperative and voluntary actions as alternative mechanisms to the

traditional "command and control" approach. These entities seek to work with landowners, their representative organizations and other community interests in better supporting and recognizing the type of voluntary, cooperative approach embodied in the Rangeland Water Quality Management Plan. These agencies would provide information on watershed/habitat assessment and goals to watershed groups and provide project funding when it is available. The relevant regulatory agencies would also review and certify protocols for the conduct of assessments and monitoring, as well as a "toolbox" of conservation measures to assist landowners in achieving their water quality and habitat responsibilities.

Action: The State will initiate a review by State and federal entities with ESA and CWA responsibilities, in conjunction with landowner representatives, of protocols used in the Rangeland Water Quality Plan process. This review will include protocols for assessing current rangeland conditions and management practices, selection of conservation measures to address documented habitat or water quality problems or risks, and monitoring efforts to measure habitat and water quality changes over time.

The goal is to reach agreement on protocols that can be certified by the reviewing agencies as either beneficial or benign for species of concern and water quality. Range owners or operators who voluntarily develop and implement a Rangeland Water Quality Plan based upon the certified protocols will receive letters of assurance from the reviewing agencies. These letters will assure the range owners or operators that activities conducted consistent with the Plan will be deemed as in compliance with the State and federal ESA, federal Clean Water Act and the State Porter-Cologne Act.

Upon commitment by the relevant federal agencies to participate in this review, the

State will seek the additional funds required to implement the proposed Coastal Watershed Pilot Project to bolster UC Extension's capacity to conduct Rangeland Water Quality Plan workshops throughout this region.

The Pilot Project would place five regional watershed advisors along the coast from Santa Barbara County to Siskiyou County and utilize to an existing cadre of more than 20 specialists to provide them with technical support. To strengthen specialist support, the Program would add an anadromous fish specialist, restoration specialist, and natural resource social science specialist.

Agricultural Management

A variety of voluntary and regulatory efforts are now in place concerning agricultural management. Discussions have been under way for several years between State and federal entities, as well as the California Association of Resource Conservation Districts, on cooperative ways to augment these existing efforts. A draft MOU was prepared as a means to identify common goals, identify a mechanism to achieve those goals and make specific agency commitments on roles and responsibilities. More recently, representatives of the agricultural interests have participated in the continuing dialogue on this approach. The principal agreed upon goal was to better assist landowners in voluntary efforts to protect species of concern and water quality. The proposed mechanism is a joint review of the Field Office Technical Guidelines (FOTGs) of the Natural Resources Conservation Service (NRCS). The reviewing agencies would initially identify which of the FOTGs either would benefit or not adversely affect listed species and their habitat. Landowners who committed to conduct their operations consistent with the approved measures and practices would receive regulatory assurance regarding compliance with the ESA.

Action: As an augmentation to existing agricultural efforts, the State will participate in a review by State and federal entities with ESA and CWA responsibilities, in conjunction with landowner representatives, of the NRCS's Field Office Technical Guide protocols. This review will include protocols for assessing current agricultural land conditions and management practices, selection of conservation measures to address documented habitat or water quality problems or risks, and monitoring efforts to measure habitat and water quality changes over time.

The State goal is to reach agreement on protocols that can be certified by the reviewing agencies as either beneficial or benign for species of concern and water quality. Agricultural owners or operators who implement certified protocols will receive letters of assurance from the reviewing agencies.

Currently, the draft MOU only provides a mechanism to specifically review the FOTGs from a species protection perspective. The WPRC seeks to expand the review to fully review the FOTGs from a State and federal water quality perspective. Discussions have begun with EPA on means to accomplish this goal. Such a expansion could enable agricultural owners or operators to receive letters of assurances that activities conducted consistent with the certified FOTGs will be deemed as in compliance with the State and federal ESA, federal Clean Water Act and the State Porter-Cologne Act.

Funding Assistance Programs

The following programs are recommended for improvements and augmentation:

Williamson Act Program

Legislation: The governor's Williamson Act Advisory Committee has recommended changes in legislation. Most changes are technical to fine-tune the performance of the act.

Regulations: DOC is planning to rewrite the act's regulations. Most of the changes are updates, clarification and fine-tuning.

Funding: Ongoing funding is needed for the program audits, although funding is secure through FY 1998-99. Also, funding is needed to continue work started last year with one-time funding to digitize all county Williamson Act maps and related land use information. Finally, many landowners feel that the tax benefit is no longer sufficient to provide an incentive for landowners to stay in Williamson Act contracts. The extent to which that is true is not known.

Agricultural Land Stewardship Program (ALSP)

The ALSP has no baseline funding, but received \$1.0 million in the FY 1996-97 budget, and \$1.975 million in the FY 1998-1999 budget, and 13.7 million in the FY 1998-1999 budget. This level of funding, in combination with a similar level of matching funds from the federal Farmland Protection Program, allows for limited grants, with the program operating essentially as a demonstration program. Continued baseline funding is needed for this program.

Soil Resources Protection Program (SRPP)

A citizen advisory committee produced a soil conservation plan in 1990. The plan included recommendations regarding financial support, on a cost-share basis, for basic RCD operations and for the administration of technical and educational programs. There is currently no state funding of the operations of RCDs. Another recommendation called for the establishment of an RCD grant program for locally initiated watershed restoration projects. The governor's 1996-97 budget contained \$120,000 to initiate the grant program under DOC. Continued funding for the RCD grant program was proposed in the governor's 1997-98 Watershed Initiative at a funding level of \$750,000, but was eventually approved by the Legislature and included in the adopted budget at the previous year's

funding level of \$120,000. This funding level continued in FY 1998-99.

The plan also proposed creation of RCD area field representatives to function as ombudsmen to facilitate bridging, blending and brokering the delivery of conservation program resources among state, federal and local agencies and through RCDs. A two year pilot project testing the merits of RCD field representatives is now underway in the San Joaquin Valley with a one-time grant of NRCS funds and a small match of DOC watershed funds. The second quarter report from this test project describes how the field representative assists RCDs in understanding their powers and authorities under Division 9, developing ongoing strategic plans, publicizing RCD activities and locating resources and partners to complete watershed projects.

RCDs are generally underfunded, with minimal staff. Their reliance on other agencies for support does not provide them with a stable base from which to work. Additional funding for the long-term could be used to support staff for the RCDs to administer contracts and promote stewardship programs.

Santa Rosa-Sotoyome RCD is spearheading a number of efforts aimed at watershed stewardship and restoration of Russian River tributaries, including interagency coordination, the Northwest Emergency Assistance Program (NEAP) for fishery restoration activities, Clean Water Act Section 205(j) and 319(h) grant projects for erosion control, watershed stewardship, volunteer monitoring and fishery restoration.

Farmland Mapping and Monitoring Program (FMMP)

Policy: No policy changes are planned, although there may be an opportunity to expand the mapping categories to include greater detail in determining rural, non-agricultural land uses.

Funding: Ongoing funding is needed for the program, although funding is secure for FY 1998-99. Also, funding is needed to continue work on newly mapped areas,

such as Lake County and Eastern Siskiyou County, and to conduct the land use inventory in yet-to-be released soil surveys in the Central Valley.

Fertilizer Research and Education Program (FREP)

California's multitude of crops and climates pose a big challenge. With more than 200 crops grown in California, it is impossible to develop adaptive research and outreach projects to effectively address every situation. Therefore, the FREP approach has been to concentrate on those farming systems that pose the highest potential threat and where payoffs appear most promising. Most of its work focuses on two agricultural systems, cool-season vegetable crops grown in California's coastal areas and the fruit and nut tree crops of the Central Valley.

FREP program goals, though supported by the fertilizer industry leadership, have not yet been effectively translated into clear incentives to their workforce, particularly to the salespeople.

Fertilizer is inexpensive relative to other production inputs and their market value. The potential savings from fertilizer use reduction may be perceived as not worth the increased risk of potential loss of crop yield or quality. Given the uncertainties of crop production, applying more fertilizer than may be needed is a rational management strategy. Over-application of fertilizer is probably seen by many growers as an inexpensive insurance program. This situation could only be fundamentally changed if food prices were to reflect the environmental costs associated with crop production.

Lastly, improvements in fertilizer practices will not have immediate or easily measurable effects on groundwater quality. It is possible under certain circumstances for nitrate levels to rise while growers are adopting improved practices. This is because of the travel time of nitrate beyond the root zone until it reaches the groundwater. If this is not made clear to

stakeholders, it could discourage participation or undermine credibility.

Agency Roles and Responsibilities

The objective of the WPRC Program is to encourage and facilitate the development and implementation of community-based Watershed Stewardship Plans to protect, restore, and enhance the environmental and economic values of the watershed. The general elements of a Watershed Stewardship Plan are provided in Appendix M. The WPRC will attempt to achieve this objective by enabling the State to coordinate the allocation of technical and financial resources directly to community-based watershed groups.

In addition to their on-going activities which support this objective, and to the extent that budgetary resources allow, the signatory agencies have the following specific roles and responsibilities:

The Department of Conservation (DOC) will:

- Provide geology and soil expertise to community-based watershed groups.
- Provide competitive grant funding to Resource Conservation Districts for developing Watershed Stewardship Plans.

The Department of Fish and Game (DFG) will:

- Provide biological and ecological expertise to community-based watershed groups and other agencies on all matters pertaining to fish and wildlife.
- Manage and provide for the sharing of biological data and information generated by or related to watershed planning.
- Develop watershed ecological impact and recovery models.
- Monitor the recovery of species.

- Provide competitive grant funding to community-based groups for developing Watershed Stewardship Plans.
- Provide competitive grant funding for watershed habitat restoration projects.
- Provide training in watershed assessment, restoration, and monitoring.

The Department of Forestry and Fire Protection (CDF) will:

- Provide technical assistance to community-based groups in the conduct of baseline watershed assessment work. The planning and implementation of assessment work will be conducted in a manner that utilizes existing assessments and previously collected data. The planning of additional assessments will be coordinated with other agencies that may be planning to conduct their own assessment activities.
- Provide a forestry specialist dedicated to working with community-based watershed groups on all matters pertaining to forestry.

The State Water Resources Control Board (SWRCB) will:

- Provide assistance to community-based groups on matters pertaining to water quality, especially through the activities of the Regional Water Quality Control Boards.
- Assist in planning and coordinating water quality monitoring and assessment efforts and in evaluating and interpreting results.
- Serve as a conduit for distribution of federal Clean Water Act loans and grants pertaining to watershed health.

The Department of Food and Agriculture (CDFA) will:

- Provide leadership and technical expertise in the detection and control of invasive species on public lands and waterways within critical habitat watersheds.
- Provide training to local watershed groups, land managers, and other interested parties in detecting and controlling invasive species.
- Provide education to the agricultural community and others in the implementation of the California Dairy Quality Assurance Program which addresses confined animal facilities.
- Provide leadership in fertilizer research and education in the use of nutrients in an effective manner.

Cooperate fully with other State and Federal agencies, landowners and the public in the implementation of guidelines and regulations enacted to protect and restore California's watersheds.

Supporting Local Government and Community Efforts

This WPRC Program is premised on the belief that local knowledge, self-interests and efforts are ultimately the key to success. While State and federal entities must do a better job in meeting their distinct responsibilities, fostering and supporting local government and community-based efforts is essential to protect and restore healthy, productive watersheds.

This section briefly highlights the respective roles of local governments and voluntary community-based efforts. It then summarizes the major proposed actions to better support these efforts. These proposals are described in more detail within both the funding section of State Level Efforts and the section on Program Coordination.

Local Government Efforts

The State program seeks to assist local governments in addressing responsibilities for which “the buck stops” with local government. County governments have an essential role to play. County responsibilities include private road grading and maintenance, gravel mining operations, storm water management and land-use ordinances, among others.

County governmental leaders have organized two cooperative county efforts in coastal watersheds in the area from the Oregon border to Monterey County. Working in coordination with State and federal officials, county supervisors and their staff have developed and are now implementing formal Work Plans for the protection and restoration of anadromous salmonids. Each of these efforts is briefly described below.

The Five County Effort

The Five-County effort is a cooperative venture between Del Norte, Humboldt, Mendocino, Siskiyou and Trinity Counties. Their adopted Work Plan and formal contract with the Resources Agency provides:

“...for a comprehensive review and coordination of county level land use regulations and practices as they relate to anadromous salmonid fisheries habitat within the Transboundary Evolutionary Significant Unit watersheds of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity Counties. This effort will: 1) establish a Memorandum of Agreement that will provide for cooperative planning and restoration efforts among the counties; 2) assess the adequacy of existing General Plan policies, Zoning, Subdivision and other land use ordinances; 3) review County management practices that affect Anadromous Salmonid habitat in each county; 4) recommend changes to County ordinances and/or practices as necessary; 5) develop a watershed based education/training program for local agencies and decision

makers that will foster better understanding between land use and maintenance practices and salmonid habitat; 6) provide a linkage between this short-term planning effort and long-term efforts, including the WPRC planning efforts and watershed-based community planning efforts such as CRMPs's.

This effort will be used to document existing regulation effectiveness and, where appropriate, develop alternative policies, ordinances and practices providing development standards that are suitable to maintain, or enhance anadromous Salmonid habitat. The plan will address the need to target public work projects that enhance fisheries restoration based on benefits within the watersheds, even where such watersheds cross county boundaries.

This effort will address local land use activities, and is a component of a comprehensive plan that addresses activities identified by the NMFS as contributing to the decline of coho salmon. The purpose of these efforts is to provide regulatory stability for small landowners and local agencies until a state 4(d) rule or other long-term planning and recovery effort of the state and federal government is accomplished.”

Fishery Network of Central California Coastal Counties - FishNet 4C

The Central California Coastal Counties group includes Monterey, Santa Cruz, San Mateo, Marin, Sonoma and Mendocino counties. In a recent transmittal of their Work Plan to the Resources Agency, they highlight:

“FishNet 4C is organized to support fishery restoration efforts undertaken by the State's California Watersheds Protection and Restoration Council and those of the National Marine Fisheries Service. The group provides an efficient forum for those agencies to strengthen and monitor local conservation efforts.

Our goals are to facilitate effective local actions that will maintain or improve our region's water quality and riparian habitat, provide increased assistance and education for local government and the private sector, and encourage cooperation and coordination among all levels of regulatory responsibility for fishery restoration. We seek to accomplish these goals through a process of evaluating existing activities, recommending model programs, tracking legislation, soliciting outside funding, and increasing communications among interested agencies and the public.

FishNet4C is organized to integrate policy and technical considerations. A Project Management Team (PMT) provides leadership and fiscal oversight. The PMT consists of a member of the Board of Supervisors from each county as well as local government staff with diverse responsibilities. A Work Study Committee (WSC) provides technical support and field experience for the PMT. The WSC is composed of experienced staff from local, State and federal agencies. It is our intention to retain a project coordinator to manage our efforts and staff WSC and PMT."

Other counties are actively engaged in various local watershed conservation efforts. County governments' willingness to provide a county-level approach to these resource needs could establish key parts of the framework for watershed-specific stewardship/restoration plans. The State and NMFS have expressed support for these efforts, and are currently financially contributing to them.

Voluntary, Community-Based Efforts

As experience has amply demonstrated, the greatest knowledge and commitment to healthy watersheds resides with those who live there. State and local governments seek to jointly develop a cohesive program with

the federal government to foster and support voluntary community-based protection and restoration efforts. California has a long and growing history of such efforts.

Coordinated Resource Management Plans (CRMPs) are perhaps the oldest form of community-based resource management and a good base to build upon. By expanding the scope of resources addressed, a CRMP could result in legal certainty for the participating landowners.

Other community-based organizations, such as Resource Conservation Districts, watershed conservancies and watershed groups, are important assets that already are jump-starting this process in many areas. The proposed program seeks to learn from these efforts and provide them the coordinated support and assistance to succeed.

Funding Local Government and Community Efforts

Increased, reliable funding: Since introduction of the Governor's Watershed Initiative in January 1997, the Wilson Administration has both supported increased funding for watershed level efforts and recognized that significant additional resources will be required over time to effectively implement a meaningful program. Over the past two years, the State has increased annual funding for watershed protection and restoration efforts by approximately \$11 million. The State of California also has participated as a member of *For Sake of the Salmon* in development of the proposed Pacific Salmon Fund. This proposal seeks creation of a federal matching fund for non-federal investments in watershed protection and restoration efforts. The rationale is that salmon-bearing watersheds are a significant national resource and warrant equivalent federal consideration and financial support as the Everglades in Florida.

The State of California is now working with the State of Oregon, Washington and Alaska to craft a coast-wide federal salmon/watershed fund. The intent is to propose inclusion of a six year, \$200 million per year fund in the President's FY 2000 budget proposal. This approach would leverage non-federal funds by providing a federal match for qualifying watershed investments that benefit salmon and other indicators of watershed health.

Improvements in the delivery of State and federal technical and funding support: The State Program will establish mechanisms to ensure that technical and financial resources, as well as regulatory and monitoring efforts, are better coordinated. This is intended to support local governments and community-based groups in fulfilling their local objectives within the context of the various State and federal resource protection mandates.

Watershed Monitoring

As set forth in Chapter 6 of the WPRC Report, monitoring is a key component in watershed protection and restoration programs. Protection and restoration of environmental resources requires a good monitoring program to provide the feedback needed to ensure the programs embarked upon are effective and that progress is being made to reach the goals that are set. The process of taking corrective actions or changes to the protection and restoration programs that result from this feedback is called "adaptive management."

Environmental monitoring can be expensive and the program needs to be directed at answering specific questions to keep the program focused and to keep the costs within reach. Monitoring programs are also evolutionary. They need to change over time to reflect improved knowledge and to address new questions that are posed. Therefore, the approach for monitoring program development presented below needs to be viewed within the context of a

continuous process where the program is changed and updated over time.

Approach to Refining the Monitoring Program

The approach to refining a monitoring and research program is patterned after one being developed by the CALFED agencies to coordinate their efforts for the San Francisco Bay-Delta Estuary Watershed. The CALFED effort is being lead by the IEP, USGS and SFEI and will include all the CALFED agencies and local watershed groups. However, a parallel effort is needed for the other watersheds in the State. It should follow the same time line so that an overall coordinated picture for the entire State can be set forth. The WPRC effort has a broader geographic scope than the CALFED effort.

The State can be divided into three broad areas to facilitate restoration and environmental monitoring. They are: (1) the Coastal watersheds (Water Quality Control Board Regions 1,2,3,4,8,9); (2) the Bay Delta Estuary and Central Valley (Regions 2 and 5); and (3) the Eastside watersheds (Regions 6 and 7). These areas can be further divided by watershed or Regional Board boundary, but these three areas share issues in common that in many cases are unique and should be specifically recognized in the design and implementation of restoration programs and monitoring activities. The CALFED effort is performing the restoration project coordination and monitoring integration for the Bay-Delta and Central Valley. The WPRC needs to focus its efforts in the other two areas of the State.

Recommended Tasks in Refining the Monitoring Program

One of the goals for the WPRC will be recommend a strategy for managing the coordination and integration of the State,

federal and local monitoring efforts. At present, there is no agency or interagency structure to manage such an extensive program. The management structure must integrate both statewide monitoring efforts and watershed-wide monitoring. Given the large number of federal, State, local, and nonprofit organizations that could be potentially involved in such an effort, a multi-agency umbrella monitoring/research management group reporting to the WPRC Working Group or Policy Group needs to be considered. However, a more complex structure involving regional coordination of local watershed monitoring efforts is essential. Since most of the Regional Water Quality Control Boards sit on the WPRC and Regional Board staff have been specifically allocated to watershed coordination beginning in FY 1998/99, they are the logical ones to focus coordination of the local and regional watershed group monitoring. This should be done in cooperation with the Resources Conservation Districts. The design of an effective management structure is essential to ensure that the monitoring efforts respond to the needs of the WPRC and the local watershed organizations.

The WPRC needs to develop a steering committee to oversee the development of a detailed monitoring and research program. The steering committee should include individuals from the following groups:

- Department of Fish and Game
- Board of Forestry
- State Water Quality Control Board
- North Coast RWQCB
- Central Coast RWQCB

The steering committee will develop a draft MOU and organizational structure between the state agencies to coordinate their monitoring and research activities for the Coastal watersheds. The MOU will be patterned after the MOU for the Interagency Estuary Program (IEP) for the San Francisco Bay Delta Watershed. The program will include joint funding of a monitoring project coordinator. Specific tasks will include organization of regular meetings among program leaders to pool their expertise and

resources into a cohesive coastal watershed-wide effort for monitoring and research. An annual budget of all monitoring and research activities related to watershed monitoring, fish habitat and abundance, water quantity and water quality will be prepared for approval by the WPRC. The MOU and the budget will be expanded as soon as practical to include Federal agencies performing such monitoring.

Watershed groups and stakeholder parties are expected to play a large role in the development of the WPRC monitoring program. A special effort will be made to include the monitoring activities of local groups into the WPRC monitoring program.

The Regional Board's watershed coordinators will be responsible for identifying local groups that are willing to participate in a unified monitoring effort. Watershed work teams will be established and their activities coordinated with the overall WPRC effort.

Once the organizational structure is in place, the following specific tasks should be performed:

- Work with WPRC agencies to define and clarify the overall goals and specific objectives of the WPRC monitoring and focused research program
- Develop a conceptual framework for understanding the factors controlling significant biological and environmental characteristics of the States watersheds
- Design an integrated environmental monitoring program based on an inventory of existing programs that involves identification of gaps; selection of monitoring elements; development of a process for data management, interpretation and reporting; and establishment of a process for monitoring approved restoration projects
- Identify primary research questions and develop a focused research program and review process.

A specific work plan with funding should be developed to perform these tasks. The effort should include involvement of the science panel and the advisory committees established by the WPRC. The tasks are modeled after those that will be performed by CALFED over the next several months. The WPRC effort should build off this effort and refine it as appropriate for Coastal watersheds. Each of these tasks is described in more detail below.

Task 1 - Define Expectations, Goals, and Objectives

The fundamental charge to the WPRC is to “to provide oversight of State watershed and restoration activities, including the conservation and protection of anadromous fish”. Specifically the council was directed to develop a Watershed Protection Program which shall include an Anadromous Salmonid Conservation Element for the purposes of providing conservation efforts necessary to lead to the promulgation of a 4(d) rule by the NMFS under the Federal Endangered Species Act. One key element of such a program is the monitoring effort that will be used to determine its effectiveness.

A first cut at the questions the monitoring program needs to answer is set forth in the sections above. These overarching questions form the basis of the vitally important efforts of the WPRC program. In order to assess the efficacy of this complex program they will need a scientifically founded and elegantly designed comprehensive ecological monitoring and research plan. Review of the monitoring questions and work with agency staff and stakeholders to further refine these questions so they can direct the development of a comprehensive monitoring program.

The ultimate goal of any monitoring program is to produce information that is useful in making management decisions enabled by two-way communication between scientists responsible for designing monitoring

programs and the users of the monitoring information (National Research Council 1990). Bridging this gap is a crucial task. The staff from the WPRC steering committee should work with the agencies/stakeholders and the relevant scientific community to further define expectations and goals of the efforts to collect monitoring information that will feed back to the development of the monitoring strategy. These interactions will give decision-makers and managers an understanding of the limitations of the monitoring programs and simultaneously provide the technical experts who are designing the monitoring programs with an understanding of what particular questions need answers.

The process for identifying the specific questions to be addressed by a WPRC comprehensive monitoring strategy would be achieved through the following activities:

- 1) Consulting with agency staff and stakeholders in the watersheds to review the problems already identified in Chapter 5 and to define expectations and goals for information necessary to determine the state of each problem, in priority order
- 2) Identifying expectations and goals of various ongoing and proposed restoration efforts
- 3) Identifying relevant laws, regulations, and permit requirements that require monitoring
- 4) Forming a focused review group composed of stakeholders, managers, and technical experts for facilitated discussions aimed at synthesizing information in items 1-3 to develop clear goals and objects for the integrated environmental monitoring and research program.

Task 2 - Developing a Conceptual Framework

Conceptual models are needed to incorporate current thinking by scientists about how the ecosystem is structured and

how it functions, about the effects of environmental stressors on relevant ecosystem processes, and about the influences of specific rehabilitation actions. The importance of conceptual models in ecosystem monitoring and assessment has been aptly described in a report issued by the National Research Council, *Managing Troubled Waters - The Role of Marine Environmental Monitoring* (National Academy Press 1990):

A description (i.e., a conceptual model) of the cause-effect links between human activity and anticipated environmental change is the central feature in developing specific questions to be answered [in a monitoring program]. It is the conceptual model that is the means of predicting environmental change and the results of management action - predictions that efficiently direct and focus monitoring efforts. Conceptual models describe links among the resources at risk: the physical, chemical, and biological attributes of the ecosystem; and human and natural causes of change. The understanding that results permits testable questions to be clearly stated and ultimately evaluated. By providing a context for organizing existing scientific understanding, a conceptual model also identifies important sources of uncertainty.

Although many of the questions arising from a review of existing programs were developed from implicit conceptual models of how the system works, many of these models need to be made explicit. Explicit conceptual models are not only useful in designing a future monitoring program, but are also useful to document the basis for earlier decisions. Providing an objective basis through explicit conceptual models for both the design of a monitoring program and documentation of earlier decisions is a feature essential to development of an integrated environmental monitoring and research program using an iterative approach.

Chapter 3 provides a general conceptual framework for the how the watershed processes affect water quality and fish

resource values. However, each watershed is different and the critical factors in any specific watershed will be different from other watersheds. The monitoring programs for these watersheds must be tailor made to address the issues in that watershed. This is time consuming but there is no other way to address the diversity of California's Coastal watersheds.

Task 3 - Monitoring Program Design

This section addresses two subjects. The first is development of a long-term coordinated program, which is the major focus of this chapter. The second is the development of an institutional process designed to work in the short-term (1-3 years) specifically addressing restoration project monitoring.

Successful design of a long-term integrated environmental monitoring program depends upon the identification of focused questions that can be answered effectively and which are developed from clear management objectives. Preliminary work, including definition of goals and objectives, conceptual model review, knowledge of existing programs and pilot monitoring are often necessary to refine questions and technical aspects of monitoring designs. Some of this work (e.g. defining goals and objectives, conceptual model development) is described in previous sections. The remaining work necessary is described here.

Inventory Existing Monitoring Programs

The goal of this task is to identify and assess existing monitoring programs in the coastal watersheds. Monitoring needs identified through tasks 1 and 2 can then be matched with efforts in existing monitoring programs and "gaps in need" identified for augmentation.

An initial summary of fish and water flow monitoring is discussed above. The product will be a metadata information system

providing information for each existing program on program objectives, questions addressed through monitoring, spatial coverage, attributes monitored location of sampling sites, frequency of monitoring, primary contact, reporting scheme, and funding. The system will be designed for continuous use for ongoing coordination, information on program status, and program gap analysis.

This task will need to include a specific funding allocation and include the efforts of local watershed groups doing volunteer monitoring.

Develop Monitoring Elements

The goal of this task is to narrow the focus of monitoring from the vast number of questions and parameters that could be examined to those that will produce the specific information needs. This task will be started in conjunction with Tasks 1 and 2, addressing currently known needs of WPRC agencies. Additional information derived from Task 2 and the previous tasks (defining monitoring needs and inventorying monitoring programs) will be used to subsequently modify monitoring elements to ensure their effectiveness.

Based on information described in Tasks 1 and 2 an integrated environmental monitoring and research program that focuses on WPRC's needs will be developed. The strategy will be to identify current needs, identify existing programs, identify monitoring gaps and recommend modifications of programs to fill those monitoring gaps. Quality control and assurance programs will be reviewed to ensure consistent data collection and storage protocols. Individual databases will be linked together so the data can be assessed comprehensively. The product will result in a document identifying monitoring objectives, focused questions, specific monitoring elements to address the questions, and will include a recommendation for a detailed plan of comprehensive and integrated monitoring for the estuary.

Process: Technical work teams comprised of program managers of existing programs will meet with the WPRC steering committee to determine how best to coordinate their programs and add missing components, as needed. Such a strategy has already been proposed for the efforts in the Bay-Delta Estuary and watershed by the CALFED agencies. The WPRC Steering Committee will be responsible for organizing and collating all work into a useable product that will constitute recommendations for an integrated and comprehensive monitoring program.

Develop Process for Data Management

Integrated data management will need to incorporate all aspects of the WPRC data collection and dispersal. Data/information will need to be made accessible to agency staff and stakeholders and WPRC staff in time to meet program time-lines and provide information for adaptive management plans. Data will also need to be updated regularly to meet the different program reporting time-lines and so that information from one program can be related to another.

The goal of the databases is to develop a comprehensive, integrated data management system that will allow access to biological, water quality, hydrodynamic, and physical data from the Coastal watersheds. The data can be spatially referenced through a Geographic Information System (GIS). The data include available, accessible data from public agencies, municipalities, and larger private companies and consultants. Data will be stored in an integrated system of distributed relational database that can be accessed remotely by a wide range of users. Simple queries may be conducted "on-the-fly" by scientists through menu-driven or graphical user interfaces; more complex queries can be generated by each entity's database programmers. The intent of the WPRC database project is not to duplicate or replace the efforts of any one of the entities involved, but to provide a comprehensive, integrated source of data for scientists and decision-makers. This will yield a "level playing field" for all parties by providing a common, comprehensive set of data for all types of analyses, reports,

studies, and models concerning the Coastal watersheds. This type of data management is currently used by the IEP in the Bay Delta and can be adapted to address Coastal areas.

Data quality control and confidentiality will continue to be the responsibility of the agency or group collecting the data. Once data has been checked for correctness it should be made available for others to use. This will be done either by submitting the data for inclusion into a centralized database or by posting the data to the local database that has conductivity with the other related databases. In some instances where data is collected as part of an enforcement action or other confidential purpose it may not be available until it is deemed ready for public release. The WPRC will encourage all parties who cooperate with the monitoring effort to make all data available as soon as possible. The benefit of a cooperative monitoring program is for all agencies and groups to benefit from the knowledge developed by others and in the free exchange of information. The WPRC needs to establish a policy that data, which is not freely exchanged and made subject to peer review by others, will not be used in the decision making of State agencies.

Process: The strategy of data management will be for those who are collecting data to manage it locally in a database, and link the individual databases into a single relational database that will be made accessible via the Internet. The links will be established via the Internet using open database connectivity (ODBC). Each participating agency will have an export feature built into their local database that will provide any updates or corrections to the comprehensive database. The agencies providing their data will determine when data will be made available to the server. In addition to providing access to data via the World Wide Web, participating parties will also have access to the data via an ODBC link.

The time line and costs for such system need to be developed by the steering committee.

Develop Process for Data Interpretation and Reporting

Easily understood reports released in a timely manner provide the all-important feedback about monitoring results to managers and regulators. Appropriate interpretation and display must accompany monitoring data. Annual monitoring reports are envisioned that include both data and interpretive graphs and text.

A committee of managers responsible for monitoring programs, stakeholders and regulatory representatives will meet to design an Interpretation and Reporting Plan that provides for timely and objective interpretation of all monitoring data.

Restoration Project Monitoring -- Institutional Process

Many of the Coastal watershed restoration projects do not include effective implementation effectiveness monitoring. A process needs to be in place to determine how effective these programs have been and whether they accomplished their goals. To make restoration project monitoring more effective, an effort is needed to develop guidelines and protocols to ensure that:

- Monitoring plans associated with restoration projects are sufficient to identify whether or not project goals and objectives are being met.
- A process is established for the orderly flow of data collection to information from all restoration project monitoring to provide resource managers with information on categories and types of projects that were successful and not successful.

CALFED has funded an effort address to their restoration project (often termed Category III) monitoring needs. It includes a position dedicated to chair and coordinate the monitoring of the various restoration projects by CALFED. The chair is assembling a workgroup to review existing and proposed monitoring elements of Category III projects and develop

recommendations for standardized monitoring protocols. The workgroup will also prepare recommendations for data management and information dissemination. Additional funding will be needed in Phase II to support establishment of the workgroup for a one-year period to implement this important activity.

The WPRC should develop a similar effort for Coastal watershed restoration monitoring efforts.

Task 4 - Design a Focused Research Program in cooperation with CALFED

This task includes design of a focused research program. As already stated, the goals of the focused research program are to reduce areas of scientific uncertainty affecting the achievement of management goals, to identify cause and effect relationships, and to corroborate relationships in conceptual models. While academic research should be left to the university system, focused research is applied to specific management uncertainties and needs to be pursued by resource and regulatory agencies. The CALFED program is developing such an effort. Many of the questions to be addressed by this program are similar to the issues in the Coastal watersheds. However, there are specific questions that are unique to the north Coastal watersheds that should be addressed. The WPRC should be expanded on this effort as appropriate.

The approach would include developing and maintaining a list of study questions, to select objectively a group of focused research projects, and annually to evaluate and present new study findings to the WPRC agencies.

THE WATERSHED PROTECTION AND RESTORATION COUNCIL

TABLE OF CONTENTS

<i>EXECUTIVE SUMMARY</i>	i
---------------------------------------	---

CHAPTER I - INTRODUCTION

The Challenge.....	1
New Approaches.....	1
Watershed Protection and Restoration Council.....	2
Structure of the Watershed Protection and Restoration Council.....	3
The Basic Strategy - Building Upon Current Assets.....	4
Watershed Funding.....	5
Report Scope.....	5
Next Steps.....	5

CHAPTER II - UNDERSTANDING WHAT AFFECTS ANADROMOUS FISH

Introduction.....	8
Life Histories.....	9
Steelhead.....	9
Coho.....	12
Ocean Mortality.....	13
High Seas Driftnet Fisheries Impacts.....	14
Predation.....	14
Environmental Conditions.....	16
Status of Anadromous Fish.....	16
Steelhead.....	17
Coho.....	17
Population Recovery.....	18
Hatcheries.....	18
Harvest.....	18
Steelhead.....	18
Coho.....	18
Habitat.....	19
Land Management Principles.....	19

Literature Cited.....	23
-----------------------	----

CHAPTER III - WATER POLLUTANTS AND THEIR SOURCES

Introduction.....	25
Risk Exposure Pathway.....	25
Water Quality Assessments.....	26
Pollutants.....	27
Sources of Impairments.....	30
Water Quality Factors Contributing to the Decline of Anadromous Fish.....	31
Background on Factors for Decline.....	31
Siltation.....	31
Nutrients.....	31
Dissolved Oxygen.....	32
Temperature.....	32
Flow Modification.....	32
pH.....	32
Pathogens.....	32
Toxics.....	32
Habitat Modification.....	33
Loss of Wetlands.....	33

CHAPTER IV - PROTECTION PROGRAMS

Introduction.....	34
Existing Statewide Regulatory Programs.....	34
Protecting Fish and Their Habitat.....	34
Review of CEQA Projects.....	35
California Endangered Species Act (CESA) Consultation.....	35
Streambed Alteration Agreements.....	36
Pollution Investigation and Spill Response.....	37
Mitigation Measures to Protect Species.....	37
Angling.....	37
Hatchery Operations.....	38
Control of Predatory Species.....	38
Protecting Instream Flows.....	39
Issuance of Water Right Permits.....	39
Revision of Permits and Licenses.....	41
Protecting Water Quality.....	42
Water Quality Standards.....	43
Point Source Program.....	46
Nonpoint Source Program.....	52
Forest Activities.....	57

Protecting Fish from Pesticides.....	68
Department of Pesticid Regulation Programs.....	68
Caltrans Integrated Pest Management Program (IPM).....	71
Protecting Fish from Introduced Species.....	72
Pest Exclusion Program.....	72
Hydrilla and Alligatorweed.....	72
Exotic Pest Trapping and Eradication Program.....	74
Protection Assistance Programs.....	74
Agricultural Funding Programs.....	74
Williamson Act Program.....	74
Agricultural Land Stewardship Program (ALSP).....	75
Rangeland Water Quality Plan.....	76
Soil Resources Protection Program (SRP).....	78
Farmland Mapping and Monitoring Program (FMMP).....	80
Fertilizer Research and Education Program (FREP).....	80
Nonpoint Source Funding Programs.....	82
205(j) Program.....	82
319(h) Program.....	82
Proposition 204 Funds.....	82
Watershed Sponsored Protection Activities.....	83
Resource Conservation District Programs.....	83
Association of California Water Agencies.....	83
Humboldt Bay Municipal Water District.....	83
Sonoma County Water Agency.....	84
Marin Municipal Water District.....	85
North Marin Water District.....	86
East Bay Municipal Utility District.....	87
City of Santa Cruz Water Department.....	87
Monterey Peninsula Water Management District.....	88
Private Sector Efforts.....	88
California Farm Bureau Federation.....	88
California Cattlemen's Association.....	88
Pacific Lumber Company.....	88
Watershed Interest Groups.....	88
Other Entities Involved in Protection Activities.....	88
Federal Agencies.....	89
Other California State Agencies.....	89
Other Institutions.....	89
Native American.....	89
Public Interest Groups.....	89

CHAPTER V - RESTORATION PROGRAMS

Introduction.....	91
-------------------	----

Restoration.....	91
Watershed Restoration.....	91
Stream Restoration.....	92
Natural and Artificial Production.....	92
Restoration Program Framework.....	92
Review of Watershed Conditions.....	93
Watershed Management Planning.....	94
Statewide Restoration Programs.....	98
Department of Food and Agriculture.....	98
CalWeed Database.....	98
DFG - Regional Programs.....	99
North Coast.....	99
Central Valley.....	100
South Coast.....	101
DFG - Statewide Programs.....	101
Project Planning.....	102
Fisheries Habitat Restoration Grants.....	102
Coastal Watershed Restoration Program.....	103
Sustained Yield Plans for Forest Landowners.....	103
Coho Salmon Restoration Planning.....	103
Steelhead Restoration Plan.....	104
Eel River Basin Planning.....	104
Russian River Basin Planing.....	104
Migration Barrier Removal.....	104
Unscreened Diversions Program.....	104
Instream Flow Studies.....	104
Sensitive Species and Habitat Mapping Project.....	104
Timber Tax Credit Program.....	105
Fish Tax.....	105
Public Awareness and Support.....	105
California Fish and Game Advisory Commissions.....	106
Department of Water Resources.....	106
Urban Streams Restoration Program.....	106
Gravel Restoration Projects.....	107
Instream Flow Needs Studies.....	107
Fish Ladder and Fish Screens.....	107
Land Use and Land Classification Surveys.....	108
California State Coastal Conservancy.....	108
Department of Education.....	109
Environmental Education Grant Program.....	109
California Department of Forestry and Fire Protection (CDF).....	109
Urban Forestry Grant Program.....	109
Forest Stewardship Program.....	110

California Forest Improvement Program (CFIP).....	110
California Department of Parks and Recreation.....	110
Land and Water Conservation Fund Program.....	110
Habitat Conservation Fund.....	110
Environmental Enhancement and Mitigation Program Grants.....	111
California Conservation Corps.....	111
State Water Resources Control Board.....	111
205(J) Program.....	111
319(H) Program.....	112
Proposition 204 Funds.....	112
Private Foundations and Grants.....	112
Voluntary Restoration Programs.....	112
Restoration Activities by Watershed.....	112
General Statewide Inventories.....	112
DFG Data Co-op.....	112
Water Quality Restoration Activities By Watershed.....	114
North Coast Region.....	114
San Francisco Bay Region.....	120
Subregional Watershed Activities.....	121
Central Valley Region.....	122
Central Coast Region.....	122
Los Angeles Region.....	127
Model Restoration Watersheds.....	130
The Consumes River and the American River.....	131

CHAPTER VI - MONITORING

Introduction.....	144
Questions to be Addressed.....	145
Conceptual Models and Key Indicators.....	145
Types of Monitoring.....	146
Trend Monitoring.....	146
Baseline Monitoring/Assessment.....	146
Implementation Monitoring.....	147
Effectiveness Monitoring.....	147
Validation Monitoring.....	148
Compliance Monitoring.....	148
Quality Assurance and Quality Control.....	148
Information -- Interpretation of Data.....	148
Institutional Aspects of Monitoring.....	149
Volunteer Monitoring.....	149
Monitoring Program Management.....	150
Focus of Statewide Monitoring Efforts and Needed Funding.....	150
Existing Fishery and Flow Monitoring Programs.....	151

Fishery Monitoring.....	151
Continued.....	154
Flow Monitoring.....	160
Water Quality Monitoring.....	161
Recommended Tasks in Refining the Monitoring Program.....	161
Task 1 - Define Expectations, Goals, and Objectives.....	162
Task 2 - Developing a Conceptual Framework.....	164
Task 3 - Monitoring Program Design.....	165
Task 4 - Design a Focused Research Program in cooperation with CALFED.....	167

CHAPTER VII - IMPLEMENTATION PLAN

Introduction.....	168
Summary of Actions.....	168
Watershed Assessments.....	168
Coordination of Government Policies and Programs.....	168
Coordination Between Relevant State Agencies.....	169
Technical Assistance.....	169
Regulatory Coordination.....	169
Information Management and Sharing.....	169
Coordinated Funding Cycles and Review Processes.....	170
Education and Outreach.....	170
Workshops and Training Programs.....	170
Project Tracking.....	170
Monitoring Program.....	171
State-Level Efforts.....	171
A Steelhead MOU with NMFS.....	171
Program Funding.....	171
Water Rights.....	172
Water Quality.....	172
Stormwater Discharges.....	172
Confined Animal Facilities.....	172
Pesticides.....	173
Forestry Activities.....	173
Range Management.....	174
Agricultural Management.....	174
Fish and Game Activities.....	174
Supporting Local Government and Community Efforts.....	174

Role of Federal Agencies.....	175
Basic WPRC Principles.....	176
WPRC Policies.....	177
Development of Base-Line Watershed Assessments.....	177
Program Coordination.....	180
State-level Program and Policy Coordination and Oversight.....	180
Technical Assistance.....	180
Regulatory Issues.....	181
Permit Streamlining for Watershed Enhancement and Restoration Projects.....	181
Providing Regulatory Assurance.....	181
Information Management and Sharing.....	182
Education and Outreach.....	183
Watershed Coordinators.....	183
Workshops and Training Programs.....	183
Coordinated Funding Cycles and Review Processes.....	183
Project Tracking.....	184
State-Level Efforts.....	184
Water Rights.....	187
Water Quality.....	189
Pesticides.....	194
Forestry Activities.....	197
Range Management.....	199
Agricultural Management.....	202
Funding Assistance Programs.....	202
Agency Roles and Responsibilities.....	204
Supporting Local Government and Community Efforts.....	205
Local Government Efforts.....	206
The Five County Effort.....	206
Fishery Network of Central California Coastal Counties - FishNet 4C.....	206
Voluntary, Community-Based Efforts.....	207
Funding Local Government and Community Efforts.....	207
Watershed Monitoring.....	208
Approach to Refining the Monitoring Program.....	208
Recommended Tasks in Refining the Monitoring Program.....	208
Task 1 - Define Expectations, Goals, and Objectives.....	210
Task 2 - Developing a Conceptual Framework.....	210
Task 3 - Monitoring Program Design.....	211
Task 4 - Design a Focused Research Program in cooperation with CALFED.....	214

APPENDICES

Appendix A: Executive Order W-159-97

Appendix B:	Compilation of Anadromous Fish Studies
Appendix C:	Steelhead Restoration and Management Plan
Appendix D:	List of Restoration Projects
Appendix E:	List of Watershed Projects
Appendix F:	List of Fishery Habitat Projects
Appendix G:	Salmonid Inventory
Appendix H:	Status of Actions to Restore Central Valley Chinook Salmon
Appendix I:	Clean Water Action Plan -- Key Actions
Appendix J:	Technical Assistance Needs for Landowners & Resource Users
Appendix K:	Conservation Guidelines
Appendix L:	Watershed Funding Sources
Appendix M:	General Elements of a Watershed Stewardship Plan